

Harvard
School Of
Public Health



1986–87

Official Register of Harvard University



1986-87

Official Register of Harvard University

On the Cover

This walkway between the old and the new links the School of Public Health with the community beyond.

■ **TABLE OF CONTENTS**

ACADEMIC CALENDAR	1
THE HARVARD SCHOOL OF PUBLIC HEALTH	2
DEGREE REQUIREMENTS	8
The Master's Degrees	8
Master of Science	8
Master of Public Health	9
Master of Occupational Health	10
The Doctoral Degrees	11
Doctor of Science	11
Doctor of Public Health	12
DEPARTMENTS AND LABORATORIES	13
Behavioral Sciences	13
Biostatistics	14
Cancer Biology	16
Environmental Science and Physiology	17
Epidemiology	22
Health Policy and Management	23
Maternal and Child Health	27
Nutrition	29
Population Sciences	30
Toxicology	32
Tropical Public Health	33
DIVISION OF BIOLOGICAL SCIENCES	35
POSTDOCTORAL AND SPECIAL PROGRAMS	36
Interdisciplinary Programs in Health	36
Takemi Program in International Health	37
Migration and Development Program	38
Program in Human Ecology	38
Public Health for Lawyers	38
Public Health for Dentists	39
Community Health Improvement Program	39
CENTERS, INSTITUTES, AND OFFICES	41
Center for Health Communication	41
Center for Population Studies	42
Educational Resource Center for Occupational Safety and Health	43
Institute for Health Research	44
Kresge Center for Environmental Health	44
Office of Continuing Education	45
Office of International Health Programs	46
ADMISSION AND REGISTRATION	47
EXPENSES AND FINANCIAL AID	52
COURSES OF INSTRUCTION	57
Interdepartmental	57
Behavioral Sciences	59
Biostatistics	60
Cancer Biology	63

continued

Environmental Science and Physiology	64
Epidemiology	68
Health Policy and Management	69
Maternal and Child Health	75
Nutrition	76
Population Sciences	78
Toxicology	80
Tropical Public Health	81

ADMINISTRATION AND OFFICERS OF INSTRUCTION AND RESEARCH 82

Volume 7, Number 9 September 5, 1986

Official Register of Harvard University

The *Official Register of Harvard University* (ISSN #0199-1787) is published thirteen times a year, four times in July, four times in August, and once each in September, November, January, February, and March. The *Official Register of Harvard University* is published by the Office of the University Publisher, 219 Western Avenue, Allston, MA 02134. Second class postage paid at Boston, MA.

POSTMASTER: Send address changes to *Official Register of Harvard University*, Harvard School of Public Health, Admissions Office, 677 Huntington Avenue, Boston, Massachusetts 02115. Requests for additional copies should be made directly to the Harvard School of Public Health at this address.

Every effort is made to ensure the information contained in this *Register* is accurate at the time of publication. However, the School of Public Health reserves the right to make changes without notice in tuition and fees, admission and degree requirements, courses of instruction, and other information contained herein.

Harvard University's policy is to make decisions concerning applicants, students, faculty, and staff on the basis of the individual's qualifications to contribute to Harvard's educational objectives and institutional needs. The principle of not discriminating against individuals on the basis of race, color, sex, sexual orientation, religion, age, national or ethnic origin, political beliefs, veteran status, or disability unrelated to job or course of study requirements is consistent with the purposes of a university and with the law. Harvard expects that those with whom it deals will comply with all applicable antidiscrimination laws.

Chapter 151c, Section 2B, of the General Laws of Massachusetts Any student in an educational or vocational training institution, other than a religious or denominational educational or vocational training institution, who is unable, because of his religious beliefs, to attend classes or to participate in any examination, study, or work requirement on a particular day shall be excused from any such examination or study or work requirement, and shall be provided with an opportunity to make up such examination, study, or work requirement which he may have missed because of such

absence on any particular day; provided, however, that such makeup examination or work shall not create an unreasonable burden upon such school. No fees of any kind shall be charged by the institution for making available to the said student such opportunity. No adverse or prejudicial effects shall result to any student because of his availing himself of the provisions of this section.

The Harvard School of Public Health is accredited by the Council on Education for Public Health.

■ A NOTE FROM THE DEAN

Public health is concerned with preserving and enhancing the health of populations. The scope of public health is extensive, as reflected in the range of courses, departments, centers, programs, and facilities described in this *Register*. The interests and expertise of faculty at the school are similarly diverse, extending across biological sciences, social sciences, numeric disciplines, and more.

This *Register* contains a wealth of information about educational opportunities at the School of Public Health. Though we have endeavored to make it accurate and comprehensive, it is necessarily an incomplete description of the learning experience available at the school. The School of Public Health is a place to acquire new skills; a place to enrich one's professional perspective by interacting with fellow students as well as with faculty; a place to gain a more sophisticated understanding of health sciences, health issues and problems and their possible solutions; a place to test one's ideals, objectives, and imagination against the imposing array of biological, individual, organizational, economic, and political barriers to improved public health.

The principal educational mission of the school is to prepare leaders in professional service and research aimed at promoting the health of populations. We believe we are engaged in a vital enterprise of central importance to society. We welcome those who join us at the school to share in that sense of excitement and challenge.

Harvey V. Fineberg

ACADEMIC CALENDAR 1986-87

ORIENTATION — FALL 1986

September

- 15, Monday Orientation and registration, in person, for new international students.
- 16, Tuesday Registration, in person, and opening session for new United States students.
- 17, Wednesday Registration, in person, for returning students. Department and program meetings.
- 18, Thursday and 19, Friday Faculty advisers will be available to meet with students. Last day to register without late registration fee.



Harvard School of Public Health Dean Harvey V. Fineberg, center, greets new students at fall orientation.

FALL TERM — 1986

September

- 22, Monday First period "a" and "ab" courses begin.

October

- 6, Monday Last day to register with late fee for fall.
- 13, Monday Columbus Day, a holiday.

November

- 11, Tuesday Veterans Day, a holiday.
- 14, Friday First period "a" courses end.
- 17, Monday Second period "b" courses begin.
- 27, Thursday through November 30, Sunday Thanksgiving recess.

December

- 20, Saturday through January 4, Sunday Recess.

January

- 16, Friday Last day to pre-register for spring term.
- 19, Monday Martin Luther King, Jr.'s Birthday, a holiday.
- 23, Friday Second period "ab" and "b" period courses end.
- 26, Monday through January 30, Friday Supervised special studies or field observations ("e" period).

SPRING TERM — 1987

February

- 2, Monday Registration, in person, for new students. Third period "c" and "cd" courses begin.
- 13, Friday Last day to register with late fee for spring term.
- 16, Monday Washington's Birthday, a holiday.

March

- 27, Friday Third period "c" courses end.
- 29, Sunday through April 5, Sunday Spring recess.
- 30, Monday through April 3, Friday Supervised special studies or field observations ("f" period).

April

- 6, Monday Fourth period "d" courses begin.

May

- 25, Monday Memorial Day, a holiday.
- 29, Friday Fourth period "cd" and "d" courses end.

June

- 1, Monday through 5, Friday Postclass period.
- 11, Thursday Commencement.

PHOTO CREDITS

Text Photographs Martha Stewart

Cover Photograph Christopher Morrow

Other Photographs Peggy McMahon (pp. 1, 16, 20, 29, 33, 40, 42); Christopher Morrow (pp. 3, 7, 31, 45, 59); Kendall Dudley (pp. 15, 35); David Bradley (pp. 43, 82)

THE HARVARD SCHOOL OF PUBLIC HEALTH

■ THE PROFESSION

Public health is concerned with preserving and enhancing the health of populations. In the past, public health professionals—including physicians, managers, analysts, and scientists—have been instrumental in eradicating smallpox, developing a vaccine for polio, making progress toward the prevention of tropical diseases and the cure for sexually transmitted diseases, laying the foundation for the study of nutritional deficiencies and their corrections, establishing the field of industrial hygiene, applying statistical methods to the management of diseases, and using behavioral science in the reduction of self-imposed risks.

In the area of preserving and enhancing health, what is the distinction between medicine and public health? Unlike medicine, a well-established profession with a sharp public image, public health has multiple professional identities and a more diffuse image. This diverse group includes biostatisticians and epidemiologists, health administrators and educators, nutritional biochemists and cancer biologists, specialists in environmental and occupational health, and experts in behavioral and population sciences. In general, as a personal physician aims to maintain the health and to diagnose and treat diseases in an individual, the goal of the public health professional is to understand and meet the health needs of communities, groups, and nations. Where medicine follows a personal service ethic, conditioned by an awareness of social responsibilities, public health is governed by an ethic of public service, tempered by concern for the individual.

Some of the problems facing public health today include chemical and other hazards in the environment, the threat of new diseases such as AIDS, choices of lifestyle that rob millions of many healthy years, inappropriate use of medical technology, widespread inadequacy of health insurance and lack of access to the necessities of life, and the great parasitic diseases that kill and handicap millions around the globe. These represent challenges to which public health professionals continue to devote their energy and expertise.

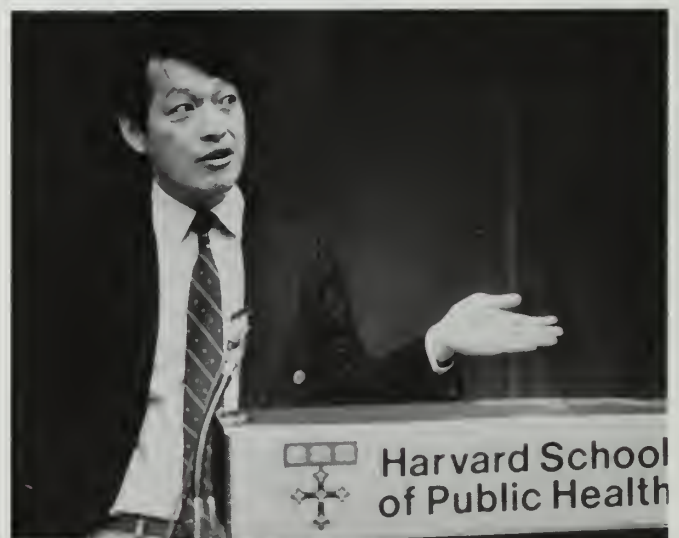
■ THE SCHOOL

The Harvard School of Public Health seeks to educate scholars who will understand and help to

ameliorate the health problems of society, to promote research that addresses these problems, and to train students to become leaders, advisers, and professional specialists sensitive to the needs of their communities.

The school's research aims to expand knowledge in health sciences by uncovering the fundamental mechanisms of disease and other causes of ill health in populations, and to improve the allocation of health resources by designing better health interventions, by improving the management of health institutions and systems, and by assisting in the development of health policy. In education, the school's overall goals are to prepare leadership in health, both national and international, for the twenty-first century, to serve the needs for continuing education in the health industry, and to increase public awareness and knowledge about health.

The school's research and teaching activities focus primarily on three areas of societal concern: health promotion and disease prevention, health policy and management, and international health, which combines and applies the first two areas in a broader setting. The programs in health promotion and disease prevention seek to understand the factors that produce illness or impair health and to develop methods of preventing or reversing them. Health policy and management attempts to



Dr. Lincoln Chen, Takemi Professor of International Health and Director of the Takemi Program, addresses the Takemi Symposium on health policy response to economic crisis derived from experiences in India and China.

bring sound analytic and decision-making practices to bear upon the more than \$350 billion health care industry. Both areas emphasize the training of professional scientists and administrators for positions in research, academe, regulatory agencies, and health service institutions, and the advancement of basic scientific research and its application to pressing public health problems. The school serves as a crossroads for international health, attracting health policy makers and public health professionals from dozens of countries.

The faculty includes 180 professors (full and visiting) drawn from a variety of disciplines spanning the natural sciences, social and managerial sciences, and numeric sciences. The school offers programs leading to the Master and Doctor of Science, Master and Doctor of Public Health, and Master of Occupational Health. Degree programs are offered in the areas of behavioral sciences, biostatistics, cancer biology, environmental science and physiology, epidemiology, health policy and management, health services administration, maternal and child health, nutrition, occupational health, population sciences, toxicology, and tropical public health, in addition to the general Master of Public Health program. The school also offers mid-career education for practitioners in public health fields.

HISTORY OF THE SCHOOL

Professional education in public health had been steadily expanding at Harvard University for more than two decades before the actual founding of the School of Public Health in 1922. Its gradual development was characterized by certain important steps, the first of which was the establishment, in 1909, of the Department of Preventive Medicine and Hygiene in the Medical School—the first such department in the United States. The first Doctor of Public Health degree was conferred in 1911, the same year the Department of Sanitary Engineering was established in the Graduate School of Engineering. In 1913, the Department of Tropical Medicine was organized in the Medical School, followed in 1918 by the Division of Industrial Hygiene.

Also in 1913, the Harvard-MIT School for Health Officers was formed under the joint management of Harvard University and the Massachusetts Institute of Technology. The School for Health Officers operated until the fall of 1922, when it was superseded by the Harvard School of Public Health, made possible by an endowment for this purpose from the Rockefeller Foundation.

The year 1986 marks the fortieth anniversary of the school's present institutional form. During the early years of the school's operation, several of its

departments functioned jointly with counterparts in the Medical School, sharing facilities, faculty, and budgets. In 1946, the school was separated administratively and financially from the Medical School and became an autonomous unit of Harvard University. It continues to cooperate with the Medical School in teaching and research, and has developed close associations with other divisions of the university, particularly the Graduate School of Arts and Sciences, the John F. Kennedy School of Government, and the Graduate School of Business Administration.

The school also maintains a close association with a wide variety of health, medical care, and welfare organizations in Massachusetts and elsewhere. The facilities of hospitals and other institutions located near the school are available to qualified students. Other local, national, and international health facilities provide opportunities for observation and special studies, and members of their staffs assist in the school's educational program. The State Laboratory Institute of the Massachusetts Department of Public Health allows qualified students to obtain experience in laboratory methods pertinent to public health.

RESOURCES

Location The school's main buildings for research, teaching, and administration are located in the heart of Boston's hospital district and Harvard University's medical campus. The facilities adjoin those of Harvard Medical School,



Harvard School of Public Health buildings, center, with Harvard Medical School, at left, and the Countway Library of Medicine, at right.

School of Dental Medicine, and Countway Library of Medicine, and are near Children's Hospital Medical Center, Beth Israel Hospital, Brigham and Women's Hospital, and other Harvard-affiliated hospitals.

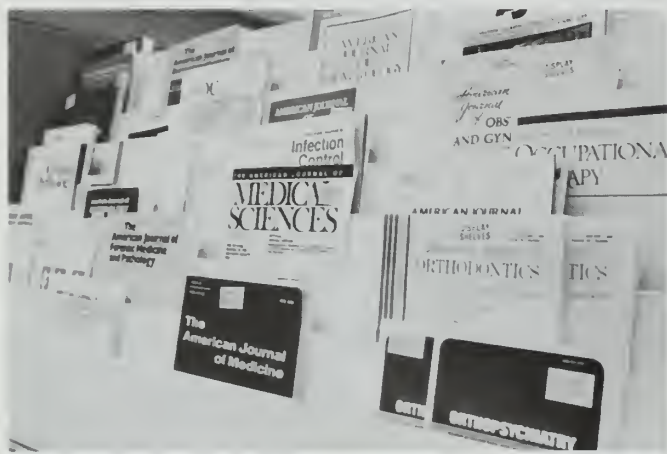
The school is also within walking distance of Boston's Museum of Fine Arts and Isabella Stewart

Gardner Museum, as well as Northeastern University and other colleges.

Public transportation to other parts of Boston is readily available. A shuttle bus, free to those affiliated with the university, runs frequently between the medical area, MIT, and Harvard's Cambridge campus.

Cross-Registration Students at the School of Public Health may enroll in courses offered by other Harvard schools, such as the Medical School, the Graduate School of Arts and Sciences, the John F. Kennedy School of Government, and the Graduate School of Business Administration. Many graduate courses at MIT and at the Fletcher School of Law and Diplomacy at Tufts University are also open to students at the school. Students are generally granted credit toward their degree for such courses, with the exception of courses in foreign languages.

Libraries The library needs of the school are served principally by the Francis A. Countway Library of Medicine. The Countway combines the resources and services of the Harvard Medical Library and the Boston Medical Library, making it the largest medical or health-related library in the country. Its recorded holdings include more than



509,000 volumes and 4,800 periodicals. The Countway also owns an extensive collection of historical materials dating from the fifteenth century. Its History of Medicine Department provides modern facilities for the use of these books and other rarities.

Students may borrow from the Harvard College Library in Cambridge and from the libraries of other Harvard schools. Messenger service is provided daily between the Harvard College Library, the Countway Library, and various other Harvard libraries. Some departments within the school also maintain libraries. The Boston Public Library, MIT

libraries, and other libraries in the Boston area add to the total book and periodical resources available to students.

Health Sciences Computing Facility Computing and data processing resources are available to students through the Health Sciences Computing Facility (HSCF). HSCF programmers and analysts assist researchers and students in using computers to analyze data, to perform extensive numerical calculations, to format text, and to acquire, maintain, and process large data bases. The interim director of HSCF is Ron Orcutt.

HSCF offers computing for school courses and programs on a variety of machines. The Digital VAX 11/780 and the Digital VAX 8200 both run under UNIX (Ultrix), an interactive, time-sharing operating system. Programming languages and software include C, Pascal, Fortran 77, Loglin (loglinear analysis), RS/1 (statistical analysis), Minitab (statistical analysis), N/I/Troff (text formatting), ig2 (graphics), GDVS and IDES (data management), and BIBLIO (bibliographic data management). The IBM 4341 runs as a batch machine under OS/VS1. PL/1 and Fortran 77 as well as SAS, SPSS, SPSSX, BMDP, and Loglin statistical packages are available on the IBM 4341.

Students may access the mini- and mainframe computers through teleprinters and video terminals located on the fifth floor of the Kresge Building and on the twelfth floor of Building 1, as well as through personal computers. In addition, a number of terminals and modems are available for student rental. There may be a charge for some of the services offered by HSCF, depending on the circumstances under which the computing is being done (depending, for example, on the course being taken) and the amount of time required; students should inquire about this before using the equipment.

HSCF also maintains a tape library of data from the National Center for Health Statistics. Documentation and tapes are available for reference and copying.

HSCF staff members participate in several computing courses given by the Department of Biostatistics. In addition, HSCF offers a number of short courses, introductory and more advanced, in specific computer languages and packages.

Microcomputer Laboratory Students and faculty may use the Microcomputer Laboratory's personal computers and software for word processing, spreadsheets, file transfer, and basic statistical analysis. Managed by HSCF as an open shop, the laboratory is located in the school's main classroom building and is open from 8 AM to 10 PM

seven days a week during the academic year. User assistants help novices with the hardware, and a small library of documentation provides information about the available software. Gerald Siddons manages the laboratory.

The Microcomputer Laboratory has 23 IBM-PCXT microcomputers with 10 Mb hard disks. Eleven of the microcomputers have color monitors, the rest have monochrome monitors, and all have dot-matrix printers. Five are wired to a MICOM port selector accessing HSCF's shared central computers, as well as one Diablo letter-quality printer. High-quality printing can also be achieved by transferring files to the VAX/UNIX laser printers. Two DEC PRO350 microcomputers with high-resolution monochrome monitors and 5 Mb hard disks are also available; one of these is hardwired to the VAX/VMS.

Software support for the IBM-PCXTs at the laboratory includes PC DOS 2.0, Lotus 1-2-3, Word-Perfect 4.1, EPISTAT (a statistical package for work with small to medium-size data samples), and Kermit 2.26 and PC-VT for file transfer and terminal emulation. The PRO350s run P/OS version 2.0, Pro-BASIC, Prose, and Pro-Communications 2.0.

HEALTH PROMOTION TASK FORCE

The Health Promotion Task Force was established by the dean to identify ways that the Harvard School of Public Health could improve the health of its own population—students, faculty, and staff. The task force comprises six subcommittees which are looking into exercise, nutrition, the physical environment, smoking, alcohol and drug abuse, and stress.

School Smoking Policy As a part of the campaign for better health, the school is working toward a smoke-free environment. Smoking is currently permitted in very limited areas, and smokers are encouraged to attend smoking cessation classes.

■ THE STUDENTS

The student body includes about 420 full- and part-time students from throughout the United States and from some forty other countries. In terms of occupational background, approximately 29 percent are physicians; also present in significant numbers are health services administrators, epidemiologists, nurses, dentists, lawyers, statisticians, environmental scientists, research assistants, psychologists, and social workers. Nearly one-third of the students are enrolled in doctoral programs.



MINORITY STUDENTS

Members of minority groups at the school have joined to form the Committee for the Underrepresented. This group meets regularly throughout the academic year to plan special events such as the symposium "An Agenda for the Underserved: Public Health, Hunger, and Nutrition," held in spring, 1986. The symposium featured addresses by Dr. J. Larry Brown, chairman of the Physician Task Force on Hunger in America and a member of the school's faculty, and by Dr. Bailus Walker, commissioner of the Massachusetts Department of Public Health, as well as workshops on food and nutrition programs, preventive health in rural and urban America, and substance abuse.

The Third World Caucus (TWC) implements programs and addresses issues that have an impact upon third world students at Harvard Medical School, School of Dental Medicine, and School of Public Health. It comprises four Harvard medical area student health organizations: Black Health Organization, Boricua Health Organization, National Chicano Health Organization, and Native American Health Organization.

Each fall, the school sponsors a reception to introduce minority students to minority alumni from the Boston area.

The school is eager to increase its enrollment of minority students, and qualified candidates are urged to apply.

INTERNATIONAL STUDENTS

One-fifth of the students at the Harvard School of Public Health come from outside the United States. The experience they bring with them lends an important dimension to the international health components of the school's academic programs and adds to the diversity of the student population.

Students from abroad are invited to participate in the Host Family Program, administered by the Harvard International Office. This program provides students with the opportunity to get to know an American family who will welcome them and ease their transition to the American way of life. For more information about the Host Family Program, contact the Harvard International Office, 1350 Massachusetts Avenue, Cambridge, MA 02138 (telephone 617-495-3349).

The Harvard International Office also operates a furniture exchange during the summer and fall to provide low-cost secondhand furniture to students and scholars newly arriving from abroad. The furniture exchange can be reached on Tuesdays and Thursdays from 10 AM to 2 PM at 617-495-9320.



HOUSING

The Henry Lee Shattuck International House is an apartment residence operated on a nonprofit basis by the school for its full-time students and their families from the United States and abroad. Located within walking distance of the school, Shattuck House consists of 72 apartments, each with a kitchenette and bath. All apartments are rented furnished with basic items except for linens, blankets, and kitchen utensils; no unfurnished units are available. The monthly rental charge includes all utilities—hot water, heat, gas, and electricity—but not telephone service.

Prospective students may submit an application for Shattuck House even before they are accepted for admission to the school. Applications for Shattuck House should be submitted by May 15, although late applications are considered as long as space is available. For application forms and more detailed information, contact Carol O'Connell, Office of Student Affairs, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1035).

The Office of Student Affairs also maintains an up-to-date list of private housing and local real estate agencies.

The Harvard University Housing Office in Cambridge administers housing in other university-owned complexes. Information and application forms may be obtained by writing to the Harvard University Housing Office, 7 Holyoke Street, Cambridge, MA 02138. Students must enclose a copy of their letter of acceptance from the school to prove affiliation. The Housing Office also maintains listings of apartments and houses not owned by the university. These listings must be viewed in person; information is not given out by mail or telephone.

CHILD CARE FACILITIES

There are a number of child care facilities in the Harvard medical area and on the Cambridge campus. They are quickly filled, so arrangements should be made as early as possible. For further information, contact the Office of the Child Care Adviser at 617-732-1489 or 617-495-2851.

CAREER SERVICES

The Coordinator of Career Services in the Office for Students provides career counseling, maintains a resource center composed of job listings and files on health care organizations, contacts potential employers to acquaint them with programs at the school, and acquires information about job openings. The coordinator posts open positions (permanent, summer, and part time) and produces a biweekly *Job Opportunities Bulletin*, which is distributed to all students. She assists students in writing resumes, arranging for interviews, and exploring career opportunities, complementing the efforts of departments, programs, and faculty advisers. Data collected about graduates' positions and salaries are available to prospective students. For more information about career services, please contact Kerry Anne Santry, Coordinator of Career Services, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1035).

Graduates of the school's degree programs have become ministers of health, state and municipal commissioners of public health, congressional health staff members, officials of federal regulatory agencies, managers of hospitals and health maintenance organizations, corporate health officers, and administrators of health services programs on the federal, state, and local level. Other graduates conduct basic and applied scientific research in academic, private, and government laboratories.

ALUMNI ASSOCIATION

The Alumni Association of the Harvard School of Public Health enjoys an active membership of 4,800 graduates worldwide. The association is governed by a council of twelve members, which meets each spring and again during the fall meeting of the American Public Health Association (APHA). Alumni also meet regionally in major cities in this country and abroad. These smaller gatherings are organized by members of the association and the council with assistance from the school. Reunions have been held in Boston, Chicago, Los Angeles, New York City, and Washington, DC, and in Sweden, Finland, and Bolivia.

In 1981, the Alumni Association was instrumental in establishing the Alumni Annual Fund for Student Assistance to help doctoral students in need of financial aid. Also initiated was the Margaret Dale Penrose Scholarship Fund, permanently endowed with gifts from alumni and friends. Gifts to this fund are matched by the school.

Members of the Alumni Association have also formed a network for the purpose of providing information to potential applicants to the school. A list of contacts is included with the application materials.

Each spring, the school publishes the *Alumni Bulletin*, the official publication of the Alumni Association. The *Bulletin* reports on the diverse activities of alumni in many countries, and features articles and class news contributed by graduates.

For more information about alumni activities, contact the Alumni Office, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115.



The Sebastian S. Kresge Educational Facilities Building at 677 Huntington Avenue, Boston, is one of the main buildings of the Harvard School of Public Health.

DEGREE REQUIREMENTS

The Harvard School of Public Health offers programs leading to the graduate degrees of *Master of Science* in a specified field (SM in . . .), *Master of Public Health* (MPH), *Master of Occupational Health* (MOH), *Doctor of Science* (SD), and *Doctor of Public Health* (DrPH).

In general, the master's degrees are viewed as terminal degrees for individuals who seek professional positions in public health. In a few departments, however, the SM is intended as preparation for doctoral study. The doctoral programs are designed for students with interests in the scientific basis of public health and preventive medicine who wish to pursue academic or research careers. The following sections outline the general degree requirements of each program.

Background of Applicants For all programs, the school's Committee on Admissions and Degrees considers applicants' academic ability, the relevance of their previous education and experience, and their overall qualifications for graduate professional education in public health. Applicants must also satisfy the department or program to which they are applying that their background is appropriate for specialization in the particular field. Applicants to doctoral programs must demonstrate the ability to undertake original research. The following sections describe the usual background of applicants to each program.

Most courses at the school require students to write papers, reports, and examinations; doctoral students must also complete a thesis. All programs require course work in quantitative areas. Stu-

dents who are not confident of their writing and/or math ability are advised to brush up on these skills, taking refresher courses, if necessary, before coming to the school.

For more information Because specific prerequisites and degree requirements vary with the discipline or field of specialization, prospective applicants should consult the sections of this book which describe departmental and interdisciplinary degree programs. Some programs require applicants to submit scores from the Graduate Record Examination (GRE) or from another standardized test; details about this requirement and other information about admissions procedures can be found in the section *Admission and Registration*.

For any questions not answered in this *Official Register*, please write to Mary Lou Licwinko, Director of Professional Development at the Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115, or call her at (617) 732-1036.

■ THE MASTER'S DEGREES

MASTER OF SCIENCE IN SPECIFIED FIELD

The Master of Science (SM) programs differ considerably from department to department, both in their overall goals and in their specific admission and degree requirements. An applicant may be admitted to an SM program in more than one discipline, if the program meets the requirements of both departments involved; in this case, the degree conferred specifies both fields. An applicant may be admitted to either a one-year or two-year program, as described below.

Background of Applicants Students in the SM programs come from a variety of backgrounds. Students in the one-year SM program generally hold doctoral degrees in medicine, dentistry, veterinary medicine, or in another field relevant to the department(s) to which admission is sought.

Applicants holding master's degrees may be considered for admission to one-year or two-year programs, depending upon their prior educational and professional background and upon the particular requirements of the program to which they wish to apply.



An applicant with a bachelor's degree is normally considered for admission to a two-year program. However, a few programs, including industrial hygiene, air pollution control, and radiological health (all in the Department of Environmental Science and Physiology), consider certain applicants with bachelor's degrees for a one-year program. These applicants must have had adequate scientific and engineering training and at least two years of relevant professional experience in the field of specialization.

A year or more of appropriate graduate work occasionally enables a student to fulfill the requirements of certain two-year programs in one or one-and-a-half years.

Requirements for the Degree Students enrolled in a one-year program must successfully complete at least 40 credit units, and those in a two-year program, 80 credit units. Unless they can demonstrate equivalent preparation, candidates for the SM degree must fulfill basic requirements in biostatistics and epidemiology, as follows:

1. BIO 200ab, *Introduction to Statistical Methods* (5 units) **or** BIO 201ab, *Principles of Biostatistics* (5 units) **or** HPM-BIO 219b, 219c, 219d, *Statistical Methods for Health Policy and Management* (Module I, II, and III) (2.5 units each period)
2. EPI 200a, *Applications of Epidemiology in Public Health* (2.5 units) **or** EPI 201a, *Epidemiology in Public Health* (2.5 units)

Applicants to programs in the biological sciences who lack a background in medicine or biology are advised to take ESP 205ab, *Human Physiology*, or a course in general biology elsewhere. Beyond these minimal course requirements, each department may specify additional courses that are necessary to satisfy degree requirements in the particular area of specialization.

MASTER OF PUBLIC HEALTH

The program leading to the Master of Public Health (MPH) degree is designed to prepare professionals for careers in public health practice. Through the core curriculum, the program provides a broad background in various disciplines basic to public health. Through the choice of elective courses, students may acquire more breadth of knowledge or may pursue in some depth one or more areas of particular relevance to their career goals. The MPH degree program may also serve as a required academic year for residency training in preventive medicine, aerospace medicine, and occupational medicine. The occupational medicine residency is described with the Department of Environmental Science and Physiology.

Background of Applicants MPH students come from all around the world, bringing to the program a wide variety of backgrounds and experiences. Most applicants to the MPH program hold a doctoral degree in medicine, dentistry, or veterinary medicine. However, applicants with a doctoral degree in a related field, such as biology, behavioral sciences, other natural and social sciences, law, economics, and engineering, are also considered for admission. Consideration is given to applicants with a master's degree in a field closely related to public health, such as nursing or social work, who have a highly distinguished academic record and substantial professional experience (usually at least three years in an administrative position of responsibility).

Requirements for the Degree MPH degree candidates normally complete the program in one academic year of full-time study at the school. A minimum of 40 credit units is required, but students are encouraged to take a total of 45 to 50 credit units. In some instances, with the approval of the Committee on Admissions and Degrees, a student may complete the program over a period of two academic years. In such a case, 15 of the required 20 units of MPH core courses must be taken during the first year.

The Core Curriculum The core curriculum, required of *all* MPH degree candidates, is designed to provide a fundamental knowledge of the major areas of public health, including the environment, quantitative methods, and health administration and management. The core courses are as follows:

1. ESP 201a or 201c, *Principles of Environmental Health I* (2.5 units) **plus either** ESP 202b, *Principles of Environmental Health II* (2.5 units) **or** ESP 203d, *Principles of Environmental Health III* (2.5 units)
2. BIO 200ab, *Introduction to Statistical Methods* (5 units) **or** BIO 201ab, *Principles of Biostatistics* (5 units) **or** HPM-BIO 219b, 219c, 219d, *Statistical Methods for Health Policy and Management* (Module I, II, and III) (2.5 units each period)
3. EPI 200a, *Applications of Epidemiology in Public Health* (2.5 units) **or** EPI 201a, *Epidemiology in Public Health* (2.5 units)
4. HPM 221ab, *Managing Health Delivery Organizations* (5 units) **or** HPM 220ab/220cd, *Administrative Systems* (10 units)
5. A case studies course. The selection of case studies courses varies from year to year. In 1985–86, the options included courses in law and public health, health promotion, environmental and occupational epidemiology, policy implementation, and maternal and child health in developing countries.

MPH students concentrating in occupational health may make the following substitutions in the core requirements: TOX 204a, *Introduction to Principles of Toxicology* (2.5 units) **or** TOX 205ab, *Principles of Toxicology* (5 units), **plus** ESP 233c, *Industrial Toxicology* (2.5 units), may replace ESP 201a. ESP 231cd, *Policy Issues in Occupational Health* (5 units) satisfies the management requirement.

Ordinarily, the core courses represent less than half the total number of credit units recommended for the degree, allowing for flexibility in the program. Descriptions of each course appear in the section *Courses of Instruction*.

Departmental Concentrations The MPH is an interdisciplinary degree carrying no departmental designation. Students with specialized goals may choose to concentrate in one department by taking most of their elective courses in that department. Some departments advise MPH students to take a specific set of courses over and above the MPH core curriculum, while others determine students' needs on an individual basis.

The General Program The General Program recognizes that some students seek a broader view of public health than that which a departmental affiliation offers. General Program students are free to choose their electives from any available courses related to the field of public health. Some select courses in several departments, while others opt to take the majority of their electives in a single discipline.

Combined Degree Programs Students enrolled in an MD, DMD, DDS, or DVM program may apply for concurrent admission to the MPH program (or to an SM program, although this is less usual), provided that a combined program can be arranged that meets the approval of both the Committee on Admissions and Degrees and the institution from which the doctoral degree is being earned. Students usually apply in their second or third year of medical, dental, or veterinary school for enrollment in their third or fourth year. Requirements for the MPH degree are the same for students in the combined degree program as for all other MPH degree candidates. Students in this program receive the MPH upon successful completion of both degree programs and conferral of the doctoral degree.

Additional Degrees Some students choose to continue their studies at the school after completing the MPH degree. These students may apply for an SM or doctoral program in any of the departments which offer such programs.



Master of Public Health Program Office *Chief Coordinator:* Dr. Margaret E. Drolette; *Coordinators:* Dr. Wendy K. Mariner and Dr. John B. Wyon. The coordinators have day-to-day responsibility for the MPH degree program, oversee the core curriculum, and serve as the MPH Subcommittee of the Committee on Admissions and Degrees. They meet regularly with the MPH Program Committee, which is composed of representatives from the faculty of each department, from the student body, from the alumni/ae, and from the school administration. Faculty members on this committee serve as advisers to most of the students in the General Program. The MPH Program Office serves as a departmental office for students in the General Program and as a central source of information about the MPH degree program to all students and applicants.

MASTER OF OCCUPATIONAL HEALTH

The program leading to the degree Master of Occupational Health (MOH) is designed to train physicians in the public health disciplines relevant to preventing occupational disease and injury. This one-year degree program is usually taken as part of a two-year approved residency in occupational medicine. Additional information on the program can be found in the description of the Department of Environmental Science and Physiology.

Background of Applicants Candidates must be graduates of an approved school of medicine. Those from the United States should have completed an internship or residency of at least 12 months in a hospital approved by the American Medical Association.

Requirements for the Degree Candidates for the MOH degree spend one year in residence at the

school and must complete a program of at least 40 credit units. All candidates take the courses listed below unless they can demonstrate equivalent preparation. The required courses comprise 32.5 credit units; additional courses may be selected from the curriculum approved for residencies in occupational medicine.

1. BIO 200ab, *Introduction to Statistical Methods* (5 units) **or** BIO 201ab, *Principles of Biostatistics* (5 units)
2. ESP 231cd, *Occupational Health Policy and Administration* (5 units) **or** equivalent
3. ESP 232cd, *Introduction to Occupational Medicine* (2.5 units)
4. ESP 233c, *Industrial Toxicology* (2.5 units)
5. ESP 234d, *Basic Problems in Occupational Health* (2.5 units)
6. ESP 251a, *Health Hazards of Manufacturing Processes* (2.5 units)
7. ESP 252b, *Introduction to Industrial Hygiene* (2.5 units)
8. EPI 201a, *Epidemiology in Public Health* (2.5 units)
9. EPI-ESP 215cd, *Environmental and Occupational Epidemiology* (2.5 units)
10. TOX 204a, *Introduction to Principles of Toxicology* (2.5 units)
11. ESP 243ab, *Ergonomics/Human Factors* (2.5 units) **or** ESP 241cd, *Occupational Safety* (2.5 units)

Not required, but strongly recommended: BIO 202cd, *The Analysis of Rates and Proportions* (5 units) **or** BIO 203cd, *Statistical Methods in Experimental Research* (5 units).

Descriptions of each course appear in the section *Courses of Instruction*.

■ THE DOCTORAL DEGREES

DOCTOR OF SCIENCE

The Doctor of Science (SD) degree is granted upon successful completion of a program of independent and original research in one of the basic disciplines of public health and the presentation of this research in an acceptable thesis.

Because specific prerequisites and degree requirements vary with the discipline or field of specialization, prospective applicants should consult the sections of this book which describe departmental and interdisciplinary degree programs. They are also encouraged to contact the department or program to which admission is sought for more detailed information.

An applicant may be admitted to a doctoral program in more than one discipline, if the program meets the requirements of both departments involved.

Background of Applicants Applicants to the SD program must hold at least a bachelor's degree. In some instances, an applicant will be expected to complete the SM degree at the school before being granted admission to doctoral study, in which case the student will first be admitted to an SM program.

Requirements for the Degree Students enrolled in the SD program complete a minimum of two academic years of full-time study in residence at the school. However, it generally takes longer to complete the required work and to prepare an acceptable thesis. Residence requirements are fulfilled by payment of tuition (see *Expenses*) and by pursuit of an academic program approved by the department of concentration and by the Committee on Admissions and Degrees.

Doctoral students are required to complete 40 to 60 credit units in graduate-level courses distributed over one major and two minor fields. Each minor field consists of at least 10 credits in formal courses. Such requirements may be increased in cases where there has been a substantial shift in field, or reduced in cases of prior relevant course work or experience. (However, the residency and tuition requirements described under *Expenses* must still be fulfilled.) Courses in the major and minor fields must be completed with grades of "A" or "B."



Mary Lou Licwinko, left, Director of Professional Development, consults with student Virginia Mackay-Smith about doctoral programs at the school.

Unless equivalent preparation can be demonstrated, doctoral students must take one of the introductory epidemiology courses (EPI 200a or EPI 201a), as well as courses in biostatistics through the intermediate level (ordinarily BIO 202cd, *The Analysis of Rates and Proportions*). Departments may stipulate specific course requirements and normally require written and/or oral examinations on the course work in the three fields.

Qualifying Examination By the end of the second year, students should be prepared to take the oral qualifying examination, which is intended to assess a student's potential to perform research in his or her chosen field. Since most doctoral research in the school requires a substantive knowledge of more than one discipline or field, the examining committee includes faculty from disciplines representing the minor fields as well as the major field. The examination includes questioning in these fields outside of the proposed research.

A research committee consisting of the student's adviser and other faculty members should be appointed within one month after the qualifying examination is passed. This committee guides the student's research through to completion, meeting with the student at least once every six months to discuss details of his or her progress.

Thesis An acceptable thesis must be submitted within five years of the date of registration as a doctoral candidate. Occasionally, upon approval of the student's research committee and of the Committee on Admission and Degrees, thesis work may be performed in nonresident status. The thesis consists of one or more manuscripts suitable for publication in a scientific medium appropriate to the candidate's field. A thesis is accepted only after a public presentation and discussion has been held, with the research committee in attendance.

The handbook *Information for Doctoral Students* is distributed during fall registration. This guide outlines in greater detail the requirements and procedures of the doctoral programs.

DOCTOR OF PUBLIC HEALTH

Like the SD degree described above, the Doctor of Public Health (DrPH) is an advanced degree which is granted upon successful completion of an approved program of independent and original investigation in a special field of public health and the presentation of the results of this research in an acceptable thesis. Formal requirements for the DrPH are the same as those for the SD. The primary difference between the two programs lies in the background of the degree candidates.

Background of Applicants Most applicants for admission to the DrPH program hold a doctoral degree in medicine, dental medicine, or veterinary medicine. Depending on the intended field of specialization, consideration may also be given to a candidate who holds an advanced degree in one of the disciplines basic to public health. The applicant must also hold, or be in progress toward, the MPH degree, or its equivalent, from an approved institution.



Dr. Yamil Kouri, HSPH master's degree recipient and doctoral candidate, delivers the Graduate Oration at the Harvard Yard commencement ceremonies.

DEPARTMENTS AND LABORATORIES

■ DEPARTMENT OF BEHAVIORAL SCIENCES

Steven L. Gortmaker, AB, SM, PhD, Associate Professor of Sociology and Acting Chairman of the Department

Faculty Professor Pierce; Visiting Professor Mertens; Associate Professor D. Walker; Lecturers Cleary and Wechsler

Teaching and Research Staff Visiting Lecturers Klein and Levine; Lecturers Benfari and McAuliffe; Instructors Daltroy and McArdle

The Department of Behavioral Sciences trains researchers, teachers, and professionals in the behavioral aspects of health and health services. Teaching and research focus on the areas of health promotion and education programs; influences of behavior on health and disease; behavioral pathologies, including mental illness and addiction to drugs and alcohol; behavioral aspects of health services, including psycho-social factors affecting the use of services and compliance with medical regimens, as well as the behavior of health professionals; and social science methodologies as applied to public health problems and the evaluation of health services and programs.

In addition to relevant elements of behavioral disciplines, students learn research skills and techniques of applying behavioral sciences to public health issues.

Activities of the Department Current areas of research include the following:

- Opiate addiction among street addicts, causes of relapse, and methods of improving drug user treatment programs; substance abuse in health professionals; alcohol and drug use among junior high school, high school, and college students, and programs to reduce such use
- Success of prenatal health programs in reducing infant mortality and morbidity (evaluation of the Robert Wood Johnson Foundation's Rural Infant Care Program)
- Long-term impact of secondary prevention programs for adolescent pregnant women and school-aged parents (conducted in seven community sites across the country)
- Women's psychosocial health status during the first six months after delivery
- Relationships among social supports, the availability and use of community services, family organizations, and the management and functioning of children with chronic illness (using data collected for the National Health Interview Surveys and the Community Child Health

Studies in three communities: Flint, MI; Cleveland, OH; and Berkshire County, MA)

- Environmental, social, and behavioral influences on childhood and adolescent obesity, focusing on the impact of television viewing, diet, and recent trends in the United States
- Reduction of mortality from coronary heart disease by altering the risk factors of elevated blood pressure, elevated blood cholesterol, and cigarette smoking (Multiple Risk Factor Intervention Trial [MRFIT])
- Role of stress and social support systems in the use of primary care health services

Degree Programs

Master of Science in Behavioral Sciences
Master of Public Health with
concentration in Behavioral Sciences
Doctor of Science

Master's candidates do course work in areas of health and behavior, health promotion and education, behavioral aspects of health services, and behavioral pathologies. Doctoral candidates develop expertise in three major areas of behavioral sciences, in research methods, in statistical computing, and in an area of specialization such as the self-help approach to alcohol and drug treatment, smoking prevention, or models of contraceptive behavior.

Background of Applicants Applicants with a bachelor's degree in a related behavioral sciences discipline are generally admitted to the two-year master's program. Applicants with a master's or a doctoral degree can be admitted directly into the doctoral program.

Career Outlook Some positions taken by recent graduates include research fellow in psychology at Harvard Medical School, lecturer on social medicine and health policy at Harvard Medical School, health promotion activities evaluator for Kaiser-Permanente Medical Group, and superintendent of social services, SARDA, Hong Kong.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

Some of the courses offered by the department are described in the section Courses of Instruction.

■ DEPARTMENT OF BIOSTATISTICS

Marvin Zelen, SB, AM, PhD, AM (hon.), Professor of Statistical Science and Chairman of the Department

Faculty Professors Drolette, Lagakos, Laird, Mosteller, Pagano, Ware, and Weinstein; Visiting Professors Feigl and Patil; Associate Professors J. Anderson, Begg, H. Feldman, Feldstein, Gelber, Gelman, D. Harrington, Louis, Mehta, Politser, Schoenfeld, and Tsiatis; Assistant Professors Amato, Boyle, Finkelstein, Gray, Hunt, James, Knuiman, Larson, Orav, Robins, and Ryan; Lecturer Bailar; Member of the Faculty Greenes; Emeritus Professor Reed

Teaching and Research Staff Lecturers and Visiting Lecturers K. Anderson, Cnaan, Day, DuMouchel, Garsd, Mangione, McFadden, Smith, Stanley, Waternaux, and Wyshak; Research Associate and Lecturer Awerbuch

The programs in the Department of Biostatistics prepare students to contribute to the theory and practice of statistical science as applied to health. The department's programs in methodological research and interdisciplinary collaborations provide many opportunities for student participation. The school has excellent computing facilities which support all the commonly used statistical packages.

The department sponsors a number of bimonthly working seminars for the purpose of bringing students and faculty together to foster new research areas. The working seminar topics for the 1985-86 academic year were bioassay, biomedical computing, clinical trials, health decision sciences, mathematical modeling, quantitative methods in AIDS research, and statistical methods in epidemiology.

The faculty includes leaders in the development of statistical methods for clinical trials and observational studies, carcinogenicity and other animal experiments, and longitudinal studies. Members of the department serve on a large number of national and international advisory committees.

An introductory course in biostatistics is required of all students at the school; many students take further courses in the department. Elementary courses assume little background in mathematics and are designed for a wide audience. They aim to develop facility in quantitative reasoning, a command of basic methodology, and a critical appreciation of good statistical practice in the health sciences. Intermediate courses are designed to develop methodological skills in specific areas of application, such as epidemiology, health policy, and experimental science. Advanced courses require a background in mathematics and are primarily intended for degree candidates in biostatistics.

Activities of the Department Current areas of research include the following:

- Health effects of air pollution, carcinogenicity testing, community studies and environmental monitoring, carcinogenic effects of food dyes, effects of particulate air pollution on respiratory health among children, meta-analysis, and statistical aspects of the study of AIDS
- Research and development of statistical and computing methods for clinical trials, including sequential methods and survival models; environmental and epidemiologic research, including methods for longitudinal studies; analyses with incomplete data; and multiparameter estimation problems
- Statistical computing algorithms, data-base management, software engineering, and expert systems
- Collaborative clinical research in the treatment of cancer in more than 150 national and international clinical trials
- Quantitative problems in health risk analysis, technology assessment, and clinical decision making, including new methods for assessing risks and benefits associated with environmental regulations; costs, risks, and benefits of clinical practices and medical technologies; and the impact of organizational structure on decision making
- International health projects based on the department's designation by the World Health Organization (WHO) as a Biostatistics Evaluation Center for Cancer
- Biomedical research consulting conducted through the Biostatistics Consulting Laboratory
- Collaborative research activities with biomedical scientists at the Harvard Medical School affiliated hospitals

Degree Programs

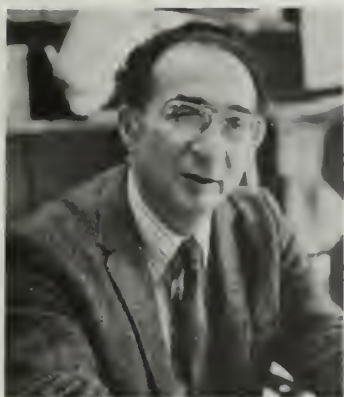
Master of Science in Biostatistics
Master of Public Health with concentration in Biostatistics
Doctor of Science
Doctor of Public Health

Areas of Concentration

Biostatistics
Applied Biomedical Computing
Health Decision Sciences

CONCENTRATION IN BIOSTATISTICS

Both the master's and the doctoral programs provide rigorous training and practical experience in



Dr. Marvin Zelen, Professor of Statistical Science and Chairman of the Department of Biostatistics, also directs the Statistics Unit at the Dana-Farber Cancer Institute.

statistical methods as they relate to the biomedical sciences. The doctoral program also seeks to develop proficiency in independent research.

Required course work includes probability, statistical inference, statistical methodology, epidemiology, and computing; electives include advanced courses in biostatistics as well as courses in biomedical sciences and health policy and management. Students are given experience in computing and have the opportunity to teach in the department's school-wide courses. They also develop consultative and data analytic skills through participation in projects of the Biostatistics Consulting Laboratory.

In their second year, all doctoral candidates take a qualifying written examination and make an oral presentation of research plans. The doctoral thesis may include either original contributions to statistical methodology related to the health sciences or an innovative application to a field of public health or medicine.

CONCENTRATION IN APPLIED BIOMEDICAL COMPUTING

This program aims to acquaint students with both hardware and software and to train them in areas of application which are important in biomedical research. Special emphases are in those areas of computing important to biostatistics. Besides the core courses in probability and biostatistics, students in this program take courses in computer operating systems, software engineering, database management, graphics, and laboratory science. These computing courses are generally available in other parts of the university. Students gain practical experience in biomedical computing in one of the Harvard-affiliated hospitals or at the Health Sciences Computing Facility of the Harvard School of Public Health.

CONCENTRATION IN HEALTH DECISION SCIENCES

This program offers training in quantitative techniques in decision making at individual (clinical) and collective (policy) levels. In addition to core courses in probability and biostatistics, students take courses in decision analysis, cost-benefit and cost-effectiveness analysis, operations research, applied economics, behavioral decision theory, and computing. While methods are taught rigorously, applications to medicine, health care policy, and environmental risk analysis are also emphasized. This is a joint program with the Department of Health Policy and Management; students may enroll in either department.

Background of Applicants Applicants to all three programs should have strong preparation in mathematics and an interest in the health sciences. It is recommended that the mathematical preparation include at least one year of analysis past elementary calculus and linear algebra. Some knowledge of computing is helpful, but not essential, as the department provides opportunities for students to become familiar with modern computing through formal courses and consulting.

Most students complete the Master of Science (SM) program in two years. Students with a graduate degree in one of the mathematical sciences or who are otherwise unusually well-prepared may complete the SM in one year. Similarly, students may enter the doctoral program directly or as a sequel to the master's program. The path to the doctoral program depends on the student's level of preparation at the time of application.

Career Outlook The career outlook for biostatisticians is excellent. There are many more open positions than available candidates. It is expected that the shortage of biostatisticians will continue through this decade. Some positions taken by recent graduates include faculty posts at universities and schools of public health, and positions in research laboratories and centers in the federal government, in pharmaceutical companies, and in research institutes.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

Some of the courses offered by the department are described in the section Courses of Instruction.

■ DEPARTMENT OF CANCER BIOLOGY

M. E. Essex, DVM, PhD, Professor of Microbiology and Chairman of the Department

Faculty Professors Cairns and Little; Associate Professors Eisenstadt, Haseltine, and Kennedy; Assistant Professors Glimcher and Mullins; Lecturer de Thé

Teaching and Research Staff Lecturers and Visiting Lecturers Cotter, Dressler, Grady, Sivak, Weichselbaum, and Werner; Visiting Scientist Tachibana; Research Associates Billings, Henson, Lee, Liber, Miller, Nagasawa, Romet-Lemonne, and Umans; Consultant McGandy; Assistant Vetrovs

The Department of Cancer Biology is primarily involved in research into the causes of cancer and offers training programs in basic and applied research leading to the Doctor of Science degree. Research activities are centered in the department's Laboratories of Carcinogenesis; Radiobiology; and Virology, Immunology, and Molecular Genetics.

Activities of the Department Current areas of research include the following:

- Precise changes in DNA sequences produced by the main categories of chemical carcinogens
- Mechanisms of mutagenesis and DNA repair
- Induction, mutation, and malignant transformation in mammalian cells by low and high LET radiations and by chemical agents
- Radiation-induced DNA damage and repair processes at the cellular and molecular levels
- Cytogenetic effects of radiation and chemical pollutants
- Effects of radiation in human diploid cells from cancer-prone patients
- Role of viruses in the cause of cancer, including hepatitis B virus and human liver cancer, and RNA tumor viruses as causes of leukemias, lymphomas, other tumors, and immunosuppressive disorders of animals and man; pathogenesis of AIDS and characterization of the family of retroviruses associated with this disease
- Tumor immunology, the molecular biology of cancer, gene regulation, and genetic events associated with the induction of leukemia and immunosuppressive disease

Degree Program

Doctor of Science

Areas of Concentration

Carcinogenesis

Radiobiology

Virology, Immunology, and Molecular Genetics



Dr. Myron Essex, Professor of Microbiology and Chairman of the Department of Cancer Biology, is an internationally recognized leader in AIDS research.

first one to two years emphasizes cancer biology, cellular and molecular biology, virology, immunology, radiation biology, and genetics. Additional courses are available in several areas of microbiology, in biochemistry, and in cell biology at the Harvard Medical School, at other Harvard schools, and at MIT. Students are encouraged to participate in the numerous seminar series and informal discussion groups offered in the Harvard Medical Area.

The program emphasizes publication of research results in the standard research literature. Most doctoral students in the department publish several papers before completing the degree. The latter part of the program involves intensive laboratory research under the guidance of a faculty adviser in the area of concentration.

Background of Applicants Consideration is given to applicants with a bachelor's degree in biochemistry, biology, or chemistry, as well as those with a clinical degree in medicine, dentistry, or veterinary medicine. Applicants should specify an area of interest. Personal interviews are encouraged.

Career Outlook Typical positions taken by recent graduates include postdoctoral research fellowships, junior faculty positions at academic institutions, and positions in independent research institutes, in governmental agencies, and in the biotechnical industry.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

To find out more about the department's activities and programs, contact Jacqueline Kelly in the Department of Cancer Biology.

Some of the courses offered by the department are described in the section Courses of Instruction.

The program aims to develop the basic skills in laboratory techniques and data handling necessary for undertaking original research. For all areas of concentration, course work during the

■ DEPARTMENT OF ENVIRONMENTAL SCIENCE AND PHYSIOLOGY

Elkan R. Blout, AB, PhD, AM (hon.), DSc (hon.), Member of the Faculty of Public Health, Dean for Academic Affairs, and Chairman of the Department

Faculty Professors Brain, Ferris, Harrington, Hornig, Mead, Moeller, Monson, Speizer, and Spengler; Associate Professors Amdur, Banzett, Burgess, Butler, Dennis, Drazen, H. A. Feldman, Greaves, Loring, and Valberg; Assistant Professors Eisen, Evans, Robins, P.B. Ryan, and Yanagisawa; Lecturers Cudworth, Shapiro, and Snook; Members of the Faculty Ingram and Leith; Emeritus Professors First and Whittenberger

Teaching and Research Staff Lecturers and Visiting Lecturers Anderson, Arndt, Ashford, Atkins, Baker, Barmaek, Beck, Bellamy, Boden, Bracken, Christiani, Ciriello, Corley, Egan, R. Feldman, Forster, Gonzalez, Hammond, Hunt, Jaeger, Kantrowitz, Karstadt, Kern, Kovach, Lakey, Landrigan, Levenstein, Levy, Mangone, B. L. Murphy, R. L. H. Murphy, Oliver, J. Ryan, Selby, Selig, Smith, Sprince, Storm, Szabo, Travers, Varner, Wegman, and Youngstrom; Instructor Goldman; Research Associates and Visiting Research Associates Barry, Davis, Dockery, Fredberg, Hagestad, Hoppin, Kimball, Kobzik, Koutrakis, Lebre, Reid, Rose, Rudnick, Skornik, Stamenovic, Sweeney, Wenger, Wolfson, and Zeltner

The Department of Environmental Science and Physiology is concerned with the detection and prevention of adverse health effects caused by chemical and physical factors in occupational and community settings. The problems are complex and require the insights of many specialties. The department's faculty, research staff, and students reflect the multidisciplinary nature of the field and include applied mathematicians, chemists, economists, engineers, epidemiologists, physicians, experimental psychologists, occupational health nurses, physiologists, and physicists.

Several of the programs offer financial support to qualified individuals on a competitive basis.

Activities of the Department Current areas of research include the following:

- Inhalation toxicology, comparative respiratory physiology, and deposition and clearance of particles in the respiratory tract
- Acute and chronic epidemiologic studies of working and community populations exposed to various toxic materials
- Mechanical properties of lungs and chest wall, development of pulmonary function tests and testing equipment, and application of these methods to the study of respiratory disease in occupational and community environments
- Design and evaluation of local exhaust systems and respiratory protection devices for the protection of workers
- Personal exposure assessment of gases and particles, evaluation of chemical composition of particles, nicotine and cotinine exposures, and modeling exposures

- Instrumental methods for collection of particles and pollutant gases in industrial and environmental conditions; measurement of acid gases and particles
- Transport, transformation, and removal of environmental contaminants
- Neurologic disease in populations exposed to lead and industrial solvents
- Statistical and methodological issues in the analysis of data from occupational health studies
- Analysis of approaches for efficiently collecting exposure information in support of environmental control decisions
- Risk assessment and evaluation for hazardous waste sites and energy sources
- Failures of air cleaning systems in nuclear power plants
- Control of naturally occurring radon and radon daughter products in homes
- Protecting the public in case of a nuclear accident

Degree Programs

Master of Science in Environmental Health Sciences
 Master of Science in Physiology
 Master of Public Health with concentration in Environmental Health Sciences or Occupational Health
 Master of Occupational Health
 Doctor of Science
 Doctor of Public Health

Areas of Concentration

Occupational Health
 Industrial Hygiene and Occupational Safety
 Occupational Health Nursing
 Occupational Medicine
 Occupational Safety and Health
 Physical Sciences and Engineering
 Air Pollution
 Environmental Health Management
 Industrial Hygiene and Occupational Safety
 Radiological Health (Radiation Protection)
 Respiratory Biology
 Respiratory Epidemiology

OCCUPATIONAL HEALTH

Richard R. Monson, SB, MD, SM in Hyg., SD in Hyg., Professor of Epidemiology and Director of the Educational Resource Center for Occupational Safety and Health

The training programs in occupational safety and health listed below are offered through the NIOSH-sponsored Educational Resource Center for Occupational Safety and Health at Harvard (see *Centers, Institutes, and Offices*).

Industrial Hygiene and Occupational Safety

The two-year Master of Science (SM) program in industrial hygiene and occupational safety is an integral component of the Educational Resource Center for Occupational Safety and Health. Admissions and curriculum are administered through the department's Physical Sciences and Engineering program unit, described further along in this section of the *Register*.

Occupational Health Nursing

A two-year educational program for the preparation of graduate nursing students at the master's level in occupational health and occupational health nursing is offered in collaboration with the Boston University School of Nursing. One academic year is spent at the Harvard School of Public Health and one calendar year at Boston University. Upon completion of degree requirements, a Master of Science in Occupational Health Nursing degree is awarded by Boston University and a Master of Science in Physiology (Occupational Health) degree is awarded by Harvard University.

The program places major emphasis on identification of health hazards, workplace assessment, program planning and intervention, worker health promotion, and disease and injury prevention. The training includes courses in occupational health, industrial hygiene, epidemiology, biostatistics, toxicology, occupational health nursing, health behavior, administration, and policy.

Some financial support may be available for United States citizens or permanent residents through traineeships or scholarships. For more information, contact Patricia H. Travers, SM, Boston University School of Nursing, 635 Commonwealth Avenue, Boston, MA 02215 (telephone 617-353-4071).

Background of Applicants Applicants must have at least a bachelor's degree in nursing from a program accredited by the National League for Nursing and three years of nursing experience. Documents required for application include a goal statement, college transcripts, letters of recommendation from three persons, aptitude scores from the Graduate Record Examination (GRE) and

the Miller Analogies Test, evidence of satisfactory completion of a basic statistics course, and registration to practice nursing in a state or territory. Applicants must apply to and be accepted by both institutions. To facilitate this process, applicants are asked to submit only one set of the required three letters of recommendation, one goal statement, and one set of college transcripts, but must complete the application forms for each institution. All application materials, including the Harvard application forms, are to be sent to the Graduate Admissions Office, Boston University School of Nursing, 635 Commonwealth Avenue, Boston, MA 02215.

Occupational Medicine

The one-year program in occupational medicine leads to either the Master of Occupational Health (MOH) or the Master of Public Health (MPH) degree. Physicians are trained in the public health disciplines relevant to the prevention and control of occupational disease and injury. The course work includes epidemiology, biostatistics, occupational medicine, toxicology, industrial hygiene, health policy, and administration.

The Harvard School of Public Health—University of Massachusetts Joint Occupational Medicine Residency includes the didactic training outlined above and a practicum year leading to board eligibility in occupational medicine. Dr. Richard R. Monson from Harvard is director of the residency; Dr. Ian A. Greaves from Harvard and Dr. Jay S. Himmelstein from the University of Massachusetts are co-directors.

Two practicum year tracks are available. The practicum year at the Harvard School of Public Health emphasizes the development of skills in occupational epidemiology. During this year, acquired abilities are applied to patient management and workplace problem solving, and a short-term research project is designed and executed under faculty supervision. Field experience includes rotations through hospital-based occupational health clinics, the Massachusetts Division of Occupational Hygiene, and corporate medical departments.

The practicum year at the University of Massachusetts Medical Center emphasizes clinical occupational medicine, although significant research opportunities also exist. Clinical electives in relevant medical and surgical subspecialties are available, and skill development in consultation and workplace interventions is stressed. For further information, contact Dr. Jay Himmelstein, Occupational Health Program, Department of Family and Community Medicine, University of Massachusetts Medical Center, 55 Lake Avenue North, Worcester, MA 01685 (telephone 617-856-3957).

Some financial support for residency candidates who are United States citizens or permanent residents may be available through traineeships or National Research Service Awards.

Background of Applicants Physicians currently holding positions in the field of occupational safety and health who plan to return to these positions are considered particularly strong candidates for admission. College-level organic and inorganic chemistry are required for admission.

The two-year residency is open to candidates who have completed at least one year of clinical training; in addition, board eligibility or certification in a primary care specialty is strongly recommended.

Applicants should submit a letter indicating their desire to enroll in the residency program with their application to the degree program. Admission to the practicum year of the residency is a separate process from admission to the degree program, but usually occurs shortly after admission to the degree program. Regardless of initial acceptance, continuation into the second year of the residency is contingent upon exemplary performance in the didactic phase of the program. Applicants who already have an MPH or equivalent degree may be eligible to enter the practicum year directly and should discuss this possibility with either Dr. Himmelstein or Dr. Greaves. Applications for the degree program are reviewed and approved beginning in September for admission in September of the following year. Applicants who require early notification should indicate this in a cover letter accompanying the application forms.

Occupational Safety and Health

The Master of Science (SM) program in occupational safety and health emphasizes the epidemiologic and biostatistical aspects of occupational safety and health. This is generally a two-year degree program, although an individual with a PhD or JD degree may complete the program in one year. It is anticipated that persons without a doctoral degree will subsequently enroll in a doctoral program.

Some financial support may be available for United States citizens or permanent residents through traineeships or National Research Service Awards. For further information, contact Dr. James M. Robins, Department of Environmental Science and Physiology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1260).

Background of Applicants Applicants normally have a bachelor's degree and advanced training in science. Applicants currently holding positions in the field of occupational safety and health who plan to return to these positions are considered particularly strong candidates for admission. College-level organic and inorganic chemistry are required for admission.

PHYSICAL SCIENCES AND ENGINEERING

John D. Spengler, SB, PhD, SM in Env.H., Professor of Environmental Health and Acting Director of the Program in Physical Sciences and Engineering

Through four areas of concentration this program unit of the department emphasizes the chemical, physical, and engineering aspects of public and occupational exposures and of contaminant control technology.

Air Pollution

The Master of Science (SM) and doctoral programs provide education in atmospheric chemistry, air monitoring, turbulence and diffusion, aerosol sciences, control technology, indoor air pollution, exposure assessment, and health effects and administration of air pollutants. The curriculum includes courses in toxicology, statistics, environmental law, and physiology. For more information, contact Dr. P. Barry Ryan, Department of Environmental Science and Physiology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1431).

Environmental Health Management

The master's and doctoral programs in environmental health management are intended for students interested in quantitative approaches to the evaluation and management of the physical environment. Students complete courses in three areas: basic environmental sciences, data analysis and inference, and decision sciences.

Basic environmental science courses include exposure assessment, environmental chemistry, physiology, and environmental/industrial toxicology. Advanced courses in environmental science may have a wide scope or may be oriented toward a specific medium (such as air, surface water, or groundwater) or pollutant (such as ionizing radiation); they may focus on monitoring, modeling, or control of pollutants. Courses in data analysis and inference include basic biostatistics and epidemiology and more advanced topics such as multiple regression and analysis of variance. The required courses in decision sciences familiarize students with concepts and techniques from operations management, statistical decision analysis, and economics.



Drs. Peter Valberg, left, and Stephen Loring describe their laboratory work in the Department of Environmental Science and Physiology.

Courses in the three basic areas are supplemented by electives, such as environmental law, environmental and natural resource policy, environmental or regulatory economics, computer science, cancer biology, and health risk assessment. Some of these electives are offered at other Harvard schools or at MIT. Students particularly interested in hazardous waste management or groundwater contamination normally take about one-third of their courses outside the Harvard School of Public Health. Students are encouraged to participate in summer internships, although this is not a requirement. For more information, contact Dr. John S. Evans, Department of Environmental Science and Physiology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1162).

Industrial Hygiene and Occupational Safety

The Master of Science (SM) and doctoral programs in industrial hygiene and occupational safety are designed to help meet the demand for professional personnel with the skills and scientific knowledge needed to identify and control health problems of the workplace. The core curriculum includes recommended and required courses dealing with basic problems in occupational health and industrial environments, manufacturing environments, environmental control, safety science, identification and measurement of air contaminants, air and gas cleaning, toxicology, biomechanics and work physiology, and aerosol technology.

Students specializing in industrial hygiene normally undertake internships and research projects dealing with toxic substances, noise, radiation, and heat stress. Those specializing in occupational safety undertake internships and projects dealing with physical hazards or work methods that cause traumatic or cumulative injury. Students graduating with an emphasis in either area will have the skills required to handle the broad range of environmental hazards existing in the workplace. For more information, contact Dr. John S. Evans, Department of Environmental Science and Physiology, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1162).

Radiological Health (Radiation Protection)

The Master of Science (SM) and doctoral programs in this area are intended for individuals pursuing careers in radiation health physics. The fundamentals of radiation detection, consequences of environmental release, protection, and control are emphasized. The curriculum includes courses in radiation protection, radiation biology, instrumentation, dosimetry, and aerosol sciences. For more information, contact Dr. Dade W. Moeller, Office of Continuing Education, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-0793).

Background of Applicants Physical Sciences and Engineering candidates normally have a bachelor's degree in engineering, chemistry, physics, mathematics, or biology. Applicants with advanced degrees in these or related disciplines and/or two or more years of relevant experience may be considered for admission to a one-year SM program. One year of undergraduate organic chemistry is required for the SM degree. Doctoral degree applicants should arrange an interview with faculty in the program.

RESPIRATORY BIOLOGY

Joseph D. Brain, AB, SM, SM in Hyg., SD in Hyg., Professor of Physiology and Director of the Program in Respiratory Biology

This program offers doctoral training in preparation for research careers in respiratory biology. It is built on a public health viewpoint of the lung as a portal of entry and a target organ for environmental agents, and focuses on two aspects of organ system physiology: respiratory mechanics and respiratory defense mechanisms. The program also emphasizes inhalation toxicology and the pathology of environmental and occupational lung disease. The biology is broadly based, ranging

from molecular and cell biology to integrated organismic, environmental, and comparative physiology; both normal and pathological physiology are included.

Intensive course work in the first two years may include physiology, biochemistry, histology, engineering, toxicology, radiation biology, statistics, epidemiology, pathology, and immunology. The latter part of the program consists of research under the guidance of a faculty adviser. Collaborative research opportunities exist in several area institutions.

Background of Applicants Candidates normally have a bachelor's degree in the physical sciences, or in biology with a strong physical science and mathematical component. The Master of Science (SM) degree is normally earned after two years, although students with prior master's degrees in related areas may earn the SM in one year. Terminal master's degree programs are not ordinarily offered; students are expected to continue for the doctoral degree.

RESPIRATORY EPIDEMIOLOGY

Benjamin G. Ferris, AB, MD, DHC (hon.), Professor of Environmental Health and Safety and Director of the Program in Respiratory Epidemiology

This program offers training at both the master's and doctoral level in preparation for research careers in respiratory epidemiology. Major work is directed toward assessing the possible effects of sulfur oxides, nitrogen dioxide, ozone, particulate matter, and other pollutants on health. This has involved both adults and children, and airborne material both indoors and outdoors. The research has been planned as a longitudinal study (about to enter its twelfth year), so that a considerable data base has been developed for both aerometrics and health data. Health effects are being assessed by standard questionnaires and simple tests of pulmonary function.

Background of Applicants Candidates are generally doctoral students or postdoctoral trainees with qualifications in medicine or biostatistics.

Career Outlook Some positions taken by recent graduates of the various programs offered by the Department of Environmental Science and Physiology include industrial hygienist with the US Department of Labor, the state of Rhode Island, and the Aluminum Company of America; assistant director, NIOSH; epidemiologist, United Auto Workers Union; coordinator of environmental quality, state of Oregon; environmental engineer and scientist in government and industry; and assistant professor in schools of medicine, public health, and nursing.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

Some of the courses offered by the department are described in the section Courses of Instruction.

■ DEPARTMENT OF EPIDEMIOLOGY

Brian MacMahon, MB, ChB, DPH, PhD, SM in Hyg., MD, MD (hon.), DSc (hon.), Henry Pickering Walcott Professor of Epidemiology and Chairman of the Department

Faculty Professors Hutchison and Monson; Associate Professors Mueller, Walker, and Willett; Assistant Professors Boyle, Hsieh, and Maclure; Member of the Faculty Tsuang; Lecturer Murphy

Teaching and Research Staff Lecturers and Visiting Lecturers Boice, Cole, Cook, Cramer, Feinleib, Finkle, Jick, Li, Morrison, Paffenbarger, and Sartwell; Research Associates Goldman, Krolewski, Yen, and Zierler

Epidemiology is the study of the frequency and distribution of disease and of its determinants. The Department of Epidemiology offers training in the application of epidemiologic methods to the investigation of diseases of unknown cause. Areas of emphasis include malignant neoplasms, cardiovascular disorders, abnormalities of reproduction and development, mental disorders, and other major diseases for which preventive measures are still unknown or inadequate.

Activities of the Department Current areas of research include the following:

- Role of viruses in the etiology of cancer
- Relationship between thyroid disease treatment and breast cancer
- Relationship between exposure to chemicals in the workplace and the development of cancer
- Health effects of oral contraceptives
- Relationship of hormonal patterns and breast cancer
- Etiology of non-Hodgkin's lymphoma, with emphasis on immune system disturbances
- Relationship of diet and risk of cancer
- Factors in youth predisposing to chronic disease
- Case identification and risk factors in mental disorders

Degree Programs

Master of Science in Epidemiology
Master of Public Health with concentration
in Epidemiology
Doctor of Science
Doctor of Public Health

tical methods in research, and computing principles and methods. Additional courses in areas of special interest and/or supervised research comprise the remainder of the program.

The doctoral programs are designed for students who plan careers of research or teaching in epidemiology. Unless course work equivalent to that described for the SM degree has been taken previously, most of the first two years is occupied with courses. Subsequently, doctoral candidates complete a thesis and gain experience in teaching and research.

Background of Applicants Most candidates for the master's program are physicians, dentists, or veterinarians. The period of research training may be extended for qualified students by admission to either of the doctoral programs or to special student status.

The department considers applications for direct admission to the Doctor of Science (SD) program from candidates holding bachelor's degrees with strong backgrounds in biology and mathematics. For these individuals, the SD generally takes four to five years to complete; candidates with relevant doctoral degrees may complete the program in three years.

Career Outlook Some positions taken by recent graduates include officer in the Epidemic Intelligence Service, Centers for Disease Control; epidemiologists at the National Cancer Institute; and appointments at universities and medical schools in research and instruction.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

Some of the courses offered by the department are described in the section Courses of Instruction.

The master's programs provide students with basic skills in epidemiologic and quantitative methods and in computing, in preparation for research careers. The one-year training program for the Master of Science (SM) degree includes most of the courses offered by the department, plus courses in principles of biostatistics, statis-

■ DEPARTMENT OF HEALTH POLICY AND MANAGEMENT

Frederick Mosteller, SB, SM, AM, PhD, SD (hon.), SSD (hon.),
Roger Irving Lee Professor of Mathematical Statistics and
Chairman of the Department

Faculty Professors and Visiting Professors Chen, Curran, Fineberg, Hiatt, Hsiao, Richmond, Roberts, Rosenkrantz, and Weinstein; Associate Professors Politser, Reich, and Shepard; Visiting Associate Professor Goldfarb; Assistant Professors J. B. Brown, Graham, Kane, Mariner, Sapienza, and Thomas; Lecturers Barnes, Barrett, Braun, J. L. Brown, P. Feldman, Hemenway, Henn, Kasten, and Palmer; Members of the Faculty Frazier, Hedley-Whyte, and Herzlinger

Teaching and Research Staff Lecturers and Visiting Lecturers Allen, Bander, Bentkover, Berarducci, Berwick, Bishoff, Bloem, Blumenthal, Bossert, Burchfield, Bycoff, Caplan, Chaine, Chalmers, Cohen, Combs, Crampton, Cupples, DeFuria, Douglass, Dumbaugh, Field, Foltz, Gougeon, Hannon, Hatch, Havas, Hester, Hobart, Hoffman, Holden, Johnson, Kinzer, Komaroff, Koplan, Landy, Lee, Liang, Lippeveld, Lorch, Marra, Mollica, Montminy, Morley, Morris, Moseley, Munier, Nesson, Newfield, Pass, Plough, Pyle, Rabkin, Rosenberg, Rosenthal, Rozovsky, Sandberg, Sands, Segall, Shapiro, Sheldon, Simon, Sohl, Stason, Strange, Stranova, Taylor, Thompson, Trevelyan, Valachovic, Vanderschmidt, Wathne, J. Winsten, M. Winsten, and Younger; Instructors Antczak, Calkins, Carrillo, and Marks; Research Associate Gerteis

The Department of Health Policy and Management is concerned with planning and managing the improvement of health care systems in the United States and abroad. When public health problems require public policy decisions, choices must be made among various programs and policies, and activities must be designed and implemented. Alternatively, a problem may be set within an individual institution such as a hospital, a community health center, or a public health agency where a manager must choose among competing programs and activities. In any setting, effective management is essential if objectives are to be achieved with the limited resources that are available.

The many aspects of health policy and management are addressed by an interdisciplinary faculty, including economists, political scientists, physicians, decision analysts, management specialists, and lawyers.

Activities of the Department Current areas of research include the following:

- **Health Management** Strategy, structure, and adaptive capabilities of the Hospital Corporation of America; the influence of culture on management decision making
- **Health Policy** Capital allocation to health institutions; community and governmental response to hunger in the United States; wages and working conditions in the home health care industry; development of a research center on health care financing and organization; "mapping" the scientific controversies underlying

public policy making; analysis of the Environmental Protection Agency during the Carter administration; rural hospital and public health services, 1920–40; fire deaths and injuries and the economics of fire and arson; risk assessment in regulatory agencies and the interaction between regulatory actions and tort in product liability law

- **Health Law** Authority of state and local health agencies in the regulation of communicable diseases; public policy alternatives in response to AIDS; development of short-term courses in management for directors and managers of biomedical research programs; medical, economic, and legal aspects of malpractice; legislation providing compensation to persons injured as a result of immunization
- **Quantitative Methods** Use of statistical methods in reporting clinical work; the value of information in assessing medical technologies; diagnostic test interpretation aids; hospital response to the DRG reimbursement system; measurement of the resource cost for physician services compared with current charges; retrievability of information reported on RCTs
- **International Health** Evaluation of national programs in essential drugs; strengths and weaknesses of the Japanese occupational health system; development of a manual for assessing the cost-effectiveness of programs for the control of diarrheal diseases and field testing of the manual in Indonesia; patterns of expenditures for biomedical research and development in 19 industrialized countries

Degree Programs

Master of Science in Health Policy and Administration
Master of Science in Health Services Administration
Master of Public Health with concentration in Health Services Administration
Doctor of Science
Doctor of Public Health

Areas of Concentration

Health Policy and Management
Medical/Dental Track
Environmental Health Track
General Track
Health Services Administration
Policy Option
Management Option
International Option
Option for Lawyers

CONCENTRATION IN HEALTH POLICY AND MANAGEMENT

The two-year Master of Science (SM) program in Health Policy and Management provides professional training for managers, policy analysts, planners, and others who intend to devote their careers to working on public health problems. The four key elements of the program are a focus on policy and management, an emphasis on skills and concepts, a grounding in the substance of public health problems, and a curriculum which combines academic and clinical activities. The program is based on the premise that training in an academic setting must be complemented by experience in problem-solving situations. The curriculum, which is updated regularly, is applied to practical situations by means of a required summer internship program and an applied research program. Dr. Diana Barrett is Director of the Graduate Program in Health Policy and Management.

A set of required core courses comprises the first year. These core courses provide the basic analytic skills and knowledge needed by professionals serving in both policy and management roles in the health field. Unless they can demonstrate prior proficiency, students take the following courses:

1. EPI 200a, *Applications of Epidemiology in Public Health* (2.5 units) **or** EPI 201a, *Introduction to Epidemiology* (2.5 units)
2. HPM-BIO 219b, 219c, 219d, *Statistical Methods for Health Policy and Management* (Module I, II, and III) (2.5 units each period)
3. HPM 220ab/220cd, *Administrative Systems* (10 units)
4. HPM 206ab, *Economic Analysis* (7.5 units)
5. HPM 279c, *Quantitative Policy Analysis* (2.5 units) **or** HPM-BIO 280c, *Decision Analysis for Health and Medical Practices* (2.5 units)
6. HPM 250d, *Policy Implementation* (2.5 units)
7. HPM 240a, *Toward an Agenda for Public Health* (2.5 units)

A required summer internship between the first and second years allows students to apply the skills and knowledge gained from the first year, and to acquire further understanding of career possibilities in the health care field.

The second-year curriculum is designed by each student in conjunction with his or her academic adviser. Maximum flexibility is provided in order to allow students to pursue their own particular areas of interest as fully as possible. Typically, each student's second-year program of study concentrates on one of two primary skill areas (either

policy or management) and in a single substantive health area (such as health services, nutrition, environment, international health, or population). Diverse course offerings allow students to develop expertise in their primary areas of concentration.

Also during the second year, students participate in an applied research program. This program includes a research project carried out in conjunction with a local public health organization or agency.

The program has three curriculum tracks, which combine the basic core disciplines of the program with courses directed toward students' specific interests. The **medical/dental track**, aimed at physicians and dentists, includes course work in clinical decision analysis and clinical trials, and offers the option of receiving the Master of Public Health degree concurrently. The **environmental health track** includes course work in the principles of environmental health and in environmental health policy analysis. All other students are enrolled in the **general track**, which includes course work in the history, sociology, politics, and economics of health care delivery in the United States. Students primarily interested in international health may, with the approval of the program director, substitute courses dealing with health services, planning, and program implementation in developing countries. Applicants interested in a particular track should so note on their application.

Background of Applicants The program seeks candidates from a wide variety of undergraduate fields whose personal characteristics, work experience, and academic record, particularly in quantitative and analytic course work, suggest outstanding potential in the areas of health policy and management. An aptitude test (GRE, GMAT, LSAT, MCAT, or DAT) is required. Applicants whose preparation appears deficient in some area, such as quantitative methods, may be offered provisional acceptance, contingent upon the successful completion of specific course work in advance of matriculation.

Candidates normally have at least one year of pertinent post-baccalaureate work experience in the health field, but exceptions are sometimes made for outstanding applicants. Deferred admission is available for some applicants who demonstrate strong potential in the field, but who have not had work-related exposure to the health care system. Students offered deferred admission work within the health system, in a position approved by the program, for a minimum of one year before matriculating.



Dr. Stephen Thomas, Assistant Professor of Political Science and Environmental Policy, leads a class on policy implementation.

One of the goals of the Harvard School of Public Health is to address the health-related problems of the underserved, both in this country and abroad. Accordingly, the program is particularly interested in receiving applications from individuals whose special concerns extend to people in inner cities, rural areas, developing countries, and other locations where such problems exist.

CONCENTRATION IN HEALTH SERVICES ADMINISTRATION

The department offers two one-year programs in Health Services Administration, one of which leads to the Master of Science (SM) degree and the other to the Master of Public Health (MPH). Dr. Howard Hiatt is the Director of the Master's Programs in Health Services Administration.

The SM program addresses the needs of individuals with advanced degrees or extensive experience in health or health-related fields, including law, who wish to specialize in the areas of health policy, planning, regulation, and/or management. The MPH program prepares professionals for public health practice. Students concentrate their studies in either policy or management, while at the same time acquiring a basic foundation in the general area of health policy and management. Curriculum options are also available for students interested in international health.

The master's programs include a required core, departmental course work in a student's area of concentration chosen from offerings within the department, and several electives chosen from within or outside the department. The following courses comprise the required core:

1. EPI 200a, *Applications of Epidemiology in Public Health* (2.5 units) **or** EPI 201a, *Introduction to Epidemiology* (2.5 units)
2. HPM 240a, *Toward an Agenda for Public Health* (2.5 units)
3. HPM 300cd, *Applied Research Tutorial* (5 units). Required for SM students only, the tutorial consists of the preparation of a written report in the student's area of concentration, focusing on a topic of interest to both the student and a member of the department's faculty. The report format may range from a case study to a research paper and, depending on the student's interests, may include field work.

Students in the MPH program must satisfy the core requirements of the MPH program as well (see *Degree Requirements*). With the exception of the applied research tutorial, students may be exempted from those requirements in which they demonstrate prior proficiency.

The **policy option** includes course work in decision theory, benefit-cost analysis, and the implementation of health policies and programs. The required courses for the policy option are as follows:

1. HPM-BIO 219c, 219d, 219d, *Statistical Methods for Health Policy and Management* (Module I, II, and III) (2.5 units each period)
2. HPM 221ab, *Managing Health Delivery Organizations* (5 units)
3. HPM 206ab, *Economic Analysis* (7.5 units) **or** HPM 205ab, *Economic Analysis for Public Health* (5 units)
4. HPM 280c, *Decision Analysis for Health and Medical Practices* (2.5 units)
5. HPM 250d, *Policy Implementation* (2.5 units)

The **management option** provides a broad overview of the field of management and focuses on the management of health delivery institutions and on the development of concrete management skills. The required courses for the management option are as follows:

1. HPM-BIO 219b, 219c, 219d, *Statistical Methods for Health Policy and Management* (Module I, II, and III) (2.5 units each period)
2. HPM 220ab/220cd, *Administrative Systems* (10 units)
3. HPM 205ab, *Economic Analysis for Public Health* (5 units) **or** HPM 206ab, *Economic Analysis* (7.5 units)

The options for lawyers and for students interested in international health offer students a policy or management perspective while allowing the flexibility needed to design an appropriate academic program of study outside the department.

Students choosing the **international option** take course work in a variety of health issues related to their interests and experience in developing countries. Especially important are electives that stress the application of analytic techniques to program design, implementation, and evaluation. The required courses for the international option are as follows:

1. BIO 200ab, *Introduction to Statistical Methods* (5 units) **or** BIO 201ab, *Principles of Biostatistics* (5 units)
2. HPM 205ab, *Economic Analysis for Public Health* (5 units) **or** HPM 206ab, *Economic Analysis* (7.5 units)
3. HPM-POP 262cd, *Health Planning and Policy for Developing Countries* (5 units)

The **option for lawyers** adds a sequence of courses that reviews legal and professional methods of standard setting for medical care programs and loss control. Lawyers with other specialties (such as environmental health law) may substitute, with departmental approval, 7.5 credit units of other appropriate law and/or policy course work for HPM 257b, HPM 254c, and HPM 258d.

1. BIO 200ab, *Introduction to Statistical Methods* (5 units) **or** BIO 201ab, *Principles of Biostatistics* (5 units)
2. HPM 221ab, *Managing Health Delivery Organizations* (5 units)
3. HPM 257b, *Physician Performance: Facilitators and Constraints* (2.5 units)
4. HPM 254c, *Risk Management Programs, Quality Controls, and Compensation Policies* (2.5 units) (not given 1986–87)
5. HPM 258d, *Evaluation of Quality of Health Care* (2.5 units)

Background of Applicants Candidates for the SM program in Health Services Administration generally hold graduate professional degrees and have some experience in health services. Typical applicants to the program are professionals in public-health-related disciplines who expect to devote a substantial portion of time in their careers to health policy and/or management issues, and lawyers who are interested in health law, patient's rights, and health planning and regulation.

The program is also designed to satisfy similar needs of health professionals who do not necessarily hold an advanced degree, but who have eight to ten years' work experience in the health services area with a high degree of responsibility, and who wish to undertake course work in their areas of specialization.

Applicants for the MPH degree must satisfy the requirements for admission to the school-wide MPH program.

All applicants must demonstrate through course work and aptitude test performance (GRE, GMAT, LSAT, MCAT, or DAT) the ability to master the quantitative and analytic content of the program.

DOCTOR OF SCIENCE/DOCTOR OF PUBLIC HEALTH

The doctoral program prepares its graduates to perform research at the professional level. Required courses cover health care processes and institutions, economics, statistical methods, management, and formal analytic methods. Students select both disciplinary and substantive area majors and minors. Disciplinary areas include economics, management sciences, political science, program evaluation and experimental design, decision sciences, and statistics. Substantive areas include disease prevention and health promotion, health care delivery, health resource allocation—capital and human, and technology assessment. A doctoral seminar is devoted to research methods. Doctoral dissertations comprising original research are advised by committees of three or more faculty members. Dr. Frederick Mosteller is director of the doctoral programs.

Background of Applicants Applicants should have strong aptitude or competence in a quantitative discipline (demonstrated through course work, work experience, and aptitude test performance on the GRE, GMAT, MCAT, or DAT), experience in the health sector, ability to organize and perform independent projects, and good interpersonal skills. Direct admission to the doctoral program is generally reserved for persons with relevant graduate education. Persons without such

education may in exceptional circumstances be directly admitted, but will generally be referred to a master's program from which their doctoral application may be made.

Career Outlook To benefit both master's and doctoral students, the department has developed an effective job placement mechanism which includes a network of contacts with potential employers throughout the country and with professionals in a wide variety of executive-level positions. Some positions taken by recent graduates include director of a community hospital, administrative director of a primary care center, director of a certificate of need program, analyst in a state regulatory agency, planner in HHS, director of a state commission on the handicapped, analyst in the Congressional Budget Office, and economist/planner with a health maintenance organization. More than half the doctoral program graduates accept positions as faculty members in universities.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

Some of the courses offered by the department are described in the section Courses of Instruction.

■ DEPARTMENT OF MATERNAL AND CHILD HEALTH

Isabelle Valadian, MD, MPH, Professor of Maternal and Child Health and Chairman of the Department

Faculty Professors Curran and Richmond; Associate Professors Deykin and Walker; Assistant Professors Gardner and Sachs; Lecturers Crocker and Dwyer; Emeritus Professor Reed

Teaching and Research Staff Lecturers and Visiting Lecturers Gold, Hollinshead, Newberger, and Stubblefield; Research Associates Butler and Harkness; Visiting Research Associate Arnold; Visiting Scholar Moore

The Department of Maternal and Child Health has as its primary goal the training of professionals committed to the maintenance and enhancement of the health of mothers and their children. The academic curriculum focuses on factors affecting lifelong health status and on the various health and welfare services needed by children and women of childbearing age.

The curriculum includes courses on the physical, social, and cognitive stages of human development from conception to adulthood; the content and structure of maternal and child health services; the role of governmental, private, and voluntary health agencies; and the methodology of needs' assessment, policy formation, and program evaluation in maternal and child health.

Activities of the Department Current areas of research include the following:

- Patterns of growth, maturation, and behavioral, social, and nutritional changes in an aging cohort; the relationship between adult health and child health and development; statistical methodology for analyzing processes of growth and development (Longitudinal Studies of Child Health and Development, started in 1930)
- Survey and assessment of Massachusetts' health services providing care for children with chronic illness or disability
- Child abuse as a predictor of subsequent self-destructive behavior in adolescence
- Functioning in families who have a child with a chronic illness or handicap
- Long-term adjustment of birthparents following adoption
- Manifestations of depression in the older adolescent
- Assessment of teen pregnancy and parenting programs
- Risk factors for very low birthweight

Degree Programs

Master of Science in Maternal and Child Health

Master of Public Health with concentration in Maternal and Child Health

Doctor of Science

Doctor of Public Health

All concentrators in maternal and child health are urged to take courses leading to an understanding of normative physical and cognitive development, of maternal and child health services, and of the legislation supporting health and social services for mothers and their children.

The Master of Science (SM) program is designed for students who wish to focus in depth on maternal and child health. The department offers both a one-year and a two-year program, depending on the background of the student. Candidates for the one-year SM must fulfill at least 20 credit units in departmental offerings, and candidates for the two-year SM, at least 30 credit units. Occasionally, courses offered in other areas of Harvard University may be substituted to meet this requirement.

The Master of Public Health (MPH) with a concentration in maternal and child health is designed primarily for established health professionals who wish to broaden their knowledge of public health policy and its application to the area of maternal and child health. Students in this program must fulfill the core curriculum of the MPH program and must also take the following courses:

1. MCH 204ab, *Content of Maternal and Child Health Programs* (5 units)
2. At least one of the following case studies courses:
 - MCH 205cd, *Planning, Implementation, and Evaluation of Maternal and Child Health Programs* (2.5 units)
 - MCH 206cd, *Maternal and Child Health in Developing Countries* (2.5 units)
3. 7.5 units from other formal courses in the Department of Maternal and Child Health

A limited number of fellowships may be available to master's degree candidates who are United States citizens concentrating in the Department of Maternal and Child Health.

Doctoral students' research activities represent a range of interests in areas of health, development, and service delivery. Recent doctoral studies have included topics such as motor development of children with Downs Syndrome, an intervention program for low-birthweight infants, and obstetric risk assessment.

Background of Applicants Applicants eligible for the one-year SM program are established practitioners or investigators holding a prior master's degree in a related field such as medicine, dentistry, nursing, social work, nutrition, physical therapy, psychology, health education, and anthropology.

Applicants eligible for the two-year SM program have either a master's degree in a field unrelated to health (such as law, education, sociology, or statistics) or a bachelor's degree in a health-related field and exceptional relevant work experience.

Applicants to the MPH program with a concentration in maternal and child health must meet the requirements of the general MPH program and have relevant experience in maternal and child health.

Applicants to the doctoral programs must have an advanced degree in a health field related to maternal and child health. Applicants are expected to have a sound academic record with documented proficiency in the quantitative sciences, relevant experience, academic career goals, and research interest in an area consonant with the goals of the department.

Career Outlook Graduates of the master's programs generally obtain positions in local, state, national, or international health agencies. Some positions taken by recent graduates include planner for the Indo-Chinese refugees' health programs for Rhode Island, director of maternal and child health for New Mexico, director of maternal and child health for the Emirate of Qatar, and nutrition consultant for the United States Public Health Service, Region I.

Students completing the doctoral program usually assume academic posts in graduate schools of public health, nursing, social work, and related disciplines. Two recent graduates now hold assistant professorships at University of North Carolina School of Public Health and at Columbia University Schools of Public Health and Social Work.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

Some of the courses offered by the department are described in the section Courses of Instruction.

■ DEPARTMENT OF NUTRITION

Peter Goldman, B Eng Phys, AM, MD, Professor of Health Sciences in Nutrition and Acting Chairman of the Department

Faculty Professors Antoniadis, Geyer, and Lown; Associate Professor Verrier; Assistant Professors Franceschi, Owen, Storch, and Sul; Lecturers Herrera-Acena, Reinhold, and Wittsch; Professors Emeriti Hegsted and Stare

Teaching and Research Staff Lecturers and Visiting Lecturers Cheung, Dichter, Hayes, el Lozy, Nicolosi, Overholt, and Samonds; Visiting Research Associate Bartholow; Research Associates Ausman, Blatt, Chu, Graboys, Lampert, Lynch, Morris, Nixon, Pantazis, Podrid, Santikarn, and Super; Assistant Gallagher

The Department of Nutrition provides training and research opportunities in basic science relating to nutrition and in practical aspects of nutrition as they affect public health. Nutrition policy and the evaluation of nutritional interventions are long-standing interests of the department, particularly as they concern problems in Latin America, Africa, and Asia, as well as in the United States. Other interests of the department range from molecular biology to human epidemiology. Students learn and use the latest techniques in biochemistry, physiology, and related fields. Research, whether basic or applied, is relevant to human health.

Activities of the Department Current areas of research include the following:

- Regulation of cell growth by hormonal growth factors and the mechanisms of such regulation
- Regulation of cellular metabolism by means of insulin and nutrients
- Use of state-of-the-art mass spectrometry to study the structure of complex carbohydrates and glycoproteins
- Pharmacological and psychological aspects of sudden cardiac death
- Preparations that transport oxygen intravenously without dependence on red cells
- Use of computers for interactive dietary analysis and counseling
- Effects of nutrition programs and methodology on the mental and physical consequences of malnutrition

Degree Programs

Master of Public Health with concentration in Nutrition
Doctor of Science
Doctor of Public Health

Areas of Concentration

Nutritional Biochemistry
Nutritional Epidemiology

Students in the Master of Public Health (MPH) program are required to take the following courses:

1. NUT 201ab, *Principles of Nutrition* (5 units)
2. NUT 204ab/204cd, *Departmental Seminars* (2.5 units)
3. At least one other course in the Department of Nutrition.



Dr. Bernard Lown, Professor of Cardiology in Nutrition, was co-recipient of the 1985 Nobel Peace Prize on behalf of International Physicians for the Prevention of Nuclear War.

CONCENTRATION IN NUTRITIONAL BIOCHEMISTRY

The doctoral program in nutritional biochemistry trains highly qualified individuals interested in laboratory-oriented approaches to solving nutrition and metabolic problems. Students are required to take graduate courses in biochemistry, physiology, epidemiology, biostatistics, and the following courses in nutrition:

1. NUT 201ab, *Principles of Nutrition* (5 units)
2. NUT 204ab/204cd, *Departmental Seminars* (2.5 units)
3. NUT 205cd, *Biochemistry and Physiology of Nutrition* (5 units)
4. NUT 214ab/214cd, *Research Techniques in Nutritional Biochemistry* (5 units)
5. 5 units from other formal courses in the Department of Nutrition

Students must also take formal course work in two minor fields, one of which must be biochemistry and the other chosen from the other basic medical sciences. Research is begun during the first year.

Background of Applicants Students with a bachelor's or master's degree may apply for admission to the Doctor of Science (SD) degree program in nutritional biochemistry. An excellent background in chemistry, biology, nutrition, or some other relevant science discipline is necessary for admission.

CONCENTRATION IN NUTRITIONAL EPIDEMIOLOGY

Some students undertake a joint doctoral program in the Departments of Nutrition and Epidemiology. This program furnishes thorough training in both of these disciplines, enabling graduates to apply sound epidemiological methods to an ever-increasing number of nutritional problems. Students in the joint program must satisfy the course requirements in both departments and must select a minor field acceptable to both departments. The thesis will concern a topic in both nutrition and epidemiology.

Background of Applicants Admission to the joint SD degree program requires a strong background in biology and mathematics and the approval of both the Department of Nutrition and the Department of Epidemiology.

Applicants to the MPH program, the joint SD program, or the Doctor of Public Health program should contact the Department of Nutrition before formally applying.

Career Outlook Some positions taken by recent graduates include assistant professor of biochemistry at a university, assistant professor and research associate at schools of medicine, postdoctoral research fellows in medical centers and universities, nutrition research director at a major food company, nutritionist at a school of public health, director of nutrition support service in a medical center, community nutritionist for a state health project, local health clinic administrator, food analytical chemist for an industrial firm, nutritionist for a federal nutrition evaluation agency, and nutrition educator for a national Tunisian institute.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

Some of the courses offered by the department are described in the section Courses of Instruction.

■ DEPARTMENT OF POPULATION SCIENCES

David E. Bell, AB, AM, LLD (hon.), Clarence James Gamble Professor of Population Sciences and International Health and Chairman of the Department

Faculty Professors Alonso, Dyck, J. Harrington, Levins, Nichols, and Salhanick; Senior Lecturer Wyon; Associate Professors Frisch and Potter; Assistant Professor Larson; Lecturers G. Berggren, Hareven, and Stark; Members of the Faculty R. Lewontin, Seeley, and Wolfson

Teaching and Research Staff Lecturers and Visiting Lecturers Augustin, Guerrero, Harkness, Lane, McIntosh, W. Mertens, and Wray; Instructor Geronimus; Senior Research Associate Yerganian; Research Associates and Visiting Research Associates Himmelstein, Holtrop, Hourihan, Hunt, S. Lewontin, Makhoul, Puccia, Valente, and Whipple; Consultants Gamble, Goldstein, and C. Thomas

The Department of Demography and Human Ecology was established in 1962 (renamed the Department of Population Sciences in 1969) and the Center for Population Studies in 1964 (see *Centers, Institutes, and Offices*). These actions were taken under the conviction that rapid population growth hampers efforts to provide better housing, education, nutrition, health services, and medical care, and that the disparity between rates of population increase and rates of development of human and economic resources is a crucial problem in many parts of the world. As the view of the role of population change in health and welfare has matured, increasing attention has been given to questions of the broader interrelations among population structure, health and welfare, and social change in both developing and industrialized countries.

Faculty affiliated with the department are specialists in biology, biostatistics, demography, ethics, economics, sociology, ecology, genetics, medicine, and community-oriented public health. The department's degree programs prepare students to participate in population programs as administrators, researchers, and educators. They aim to develop sophistication in data and information management and evaluation, and to provide a broad philosophical perspective on problems and issues in the population field and on related issues of health and health care affecting communities.

A large percentage of the students in the department are from or are primarily interested in health and population problems of developing countries. Each year, the department sponsors a field visit to Haiti.

Activities of the Department Current areas of research include the following:

- Biochemical and endocrinologic mechanisms controlling fertility

- Long-term impact of demographic changes within the United States
- Interactions of fertility, income distribution, and other aspects of socio-economic development
- Interactions of family planning with fertility, nutrition, and infectious diseases within defined communities
- Community diagnoses of causes of rates of birth, death, and migrations
- Biological aspects of population programs
- Ethical aspects of population policies and programs
- Analysis of data collected in field studies in developing countries, including studies of mortality, morbidity, nutrition status, fertility, and impact of programs
- Factors that might improve food production
- Mathematical and experimental study of human ecosystems

Degree Programs

Master of Science in Population Sciences
 Master of Public Health with concentration
 in Population Sciences
 Doctor of Science
 Doctor of Public Health

Programs of study are offered in the areas of population, health, and nutrition; the design, management, and evaluation of population programs; the analysis of complex ecological systems; demographic analyses; reproductive biomedicine; and community-oriented public health. The programs of individual degree candidates vary widely, reflecting the diversity of the students' backgrounds, national origins, previous education, areas of professional concern, and career goals.

Background of Applicants Students with bachelor's degrees in biological sciences, social sciences, or other population-related fields generally spend two years in residence toward the Master of Science (SM) degree. Students with advanced degrees or with extensive work experience generally complete study toward the SM degree in one year. Approximately one-fourth of those who complete the SM degree enter the doctoral program.

Career Outlook Some positions taken by recent graduates include director of a university center for population studies, principal statistician, executive secretary of an international committee on applied research in population, president of a medical services consultants' group, medical director of a planned parenthood association,



Dr. Rose Fritsch, Associate Professor of Population Studies, authored a study on the decreased risk of breast cancer and cancers of the reproductive system for women who were college athletes.

director of a medical clinic, program officer for the United Nations Fund for Population Activities (UNFPA), UNFPA coordinator, population intern for USAID, and associate program officer in health and nutrition for UNICEF.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

Some of the courses offered by the department are described in the section Courses of Instruction.

■ LABORATORY OF TOXICOLOGY

Armen H. Tashjian, Jr., MD, Professor of Toxicology, Professor of Pharmacology and Director of the Laboratory

Faculty Associate Professors Eisenstadt, Rice, Schonbrunn, and Toscano; Assistant Professor Samson; Lecturer Ofner

Research Staff Visiting Scientist Aratan-Spire; Research Associates Fischer and Voelkel

Toxicology is the study of the injurious effects of chemicals. The scope of modern toxicology is broad and depends on the integration of knowledge and techniques from the medical, biological, chemical, and physical sciences. The faculty and staff of the laboratory reflect this multidisciplinary aspect of toxicology.

Activities of the Laboratory Current areas of research include the following:

- Receptor-mediated toxicity
- Tumor promotion
- Biochemical regulation of cellular toxicity
- Molecular toxicology
- Mechanisms of dioxin action and toxicity
- Molecular biology of DNA repair and mutagenesis in procaryotes and eucaryotes
- Development and use of animal and human cell culture models

Degree Programs

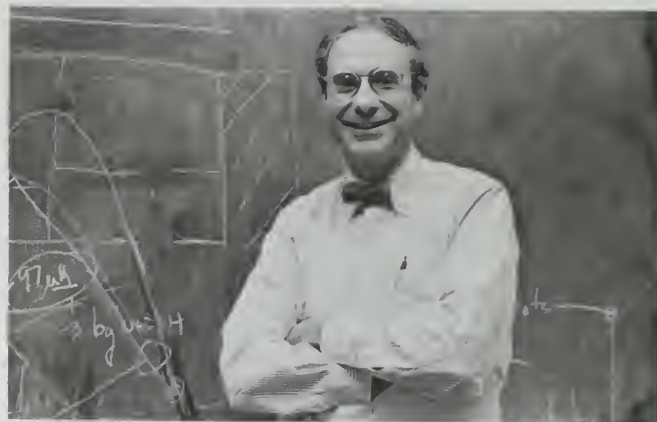
Doctor of Science, granted by the Harvard School of Public Health

Doctor of Philosophy in Pharmacology (Toxicology), granted by the Division of Medical Sciences of the Faculty of Arts and Sciences

The degree granted is determined by route of entry.

The research and training program in toxicology provides students with knowledge of the health implications of environmental chemicals, interactions of toxic agents with cellular systems, biochemical mechanisms of toxicity, identification of toxic environmental chemicals, and prevention or reversal of adverse effects where possible.

The first year is usually devoted to course work. Students take courses at the Harvard School of Public Health, the Division of Medical Sciences, and other Harvard graduate programs. Appropriate courses may also be taken at MIT. Students are expected to pass a qualifying examination before the end of the fourth semester and complete thesis research within four to five years of residence.



Dr. Armen H. Tashjian, Jr., Professor of Toxicology and Director of the Laboratory of Toxicology, has major research interests in carcinogenesis.

First-year students have the opportunity to broaden their research skills by rotations in at least three different laboratories for ten weeks each. The laboratory rotation experience is supervised by each laboratory head and enables students to become familiar with a variety of research problems and techniques. At the end of each rotation, students prepare a brief written report and give an oral presentation.

Students participate in journal clubs and weekly laboratory research meetings. Students who are well advanced in their thesis research are encouraged to present their research at appropriate regional and national scientific meetings.

Background of Applicants Candidates should have a bachelor's degree and demonstrated knowledge of organic, physical, and biological chemistry, general biology, physics, and calculus. A personal interview is strongly encouraged. The Graduate Record Examination (GRE) is required.

Career Outlook Some positions taken by recent graduates include postdoctoral research fellowships at academic institutions, junior faculty positions, and staff positions at federal agencies.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admissions requirements and procedures can be found in the section *Admission and Registration*.

For a brochure detailing the program and the interests of its faculty, contact Rebecca Siebens, Graduate Studies Coordinator, Laboratory of Toxicology, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-2286).

Some of the courses offered by the department are described in the section Courses of Instruction.

■ DEPARTMENT OF TROPICAL PUBLIC HEALTH

John R. David, AB, MD, AM (hon.), John LaPorte Given Professor of Tropical Public Health and Chairman of the Department

Faculty Professors Chernin, Pan, and Spielman; Associate Professor Wirth; Assistant Professors Harn, James, Jungery, Peattie, and Ribeiro; Lecturers Cash and Koch-Weser; Member of the Faculty Piessens; Emeritus Professor Weller

Teaching and Research Staff Lecturers and Visiting Lecturers Arias, W. Berggren, Boyer, Buck, Dammin, Foege, Hoff, Hommel, Hopkins, Mata, Michelson, Miller, Morrow, Moschella, Mott, Neva, Nussenzweig, Pereira, Schrater, Sleigh, Todd, von Lichtenberg, Weisfeld, and P. Weller; Instructor Maguire; Research Associates Fuhrman, Furlong, and Landfear

Parasitic diseases are a major health problem in the developing world, particularly in tropical regions. In the Department of Tropical Public Health, research and teaching center on the biological and ecological aspects of protozoan and helminthic diseases, as well as tuberculosis and Lyme disease. The department offers opportunities for basic study of the biology of parasitism and practical work aimed at development of better tools for diagnosis, vaccine, and control. The program accepts students at the masters, doctoral, and postdoctoral levels.

A Program of Tropical Medicine and International Health has been developed involving the faculty of the Department of Tropical Public Health at the School of Public Health and the Division of Tropical Medicine at Harvard Medical School. The program takes a multidisciplinary approach to parasitic diseases, using immunology, molecular biology, medical entomology, cell biology and ultrastructure, biochemistry, pathology, and epide-



Dr. Dyann Wirth, Associate Professor of Tropical Public Health, and colleague Robert Barker have developed a breakthrough diagnostic screening method for malaria.

miology. The program includes research within the schools and field collaborations overseas in Brazil, Venezuela, Colombia, Mexico, Kenya, Sri Lanka, Egypt, Thailand, India, China, and Indonesia.

Activities of the Department Current areas of research include malaria, *Leishmania*, *Amoeba*, *Giardia*, *Trypanosoma*, *Babesia*, *Schistosoma*, *Filaria*, *Onchocerca*, and the organisms causing tuberculosis and Lyme disease. Arthropods under study include mosquitoes, ticks, bugs, and sandflies.

Degree Programs

Master of Science in Tropical Public Health
Master of Public Health with concentration in Tropical Public Health
Doctor of Science
Doctor of Public Health

Areas of Concentration

Tropical Public Health
Biology and Epidemiology of Parasites
Vector Biology, Ecology, and Control

CONCENTRATION IN TROPICAL PUBLIC HEALTH

The basic course (TPH 201a) provides students with a comprehensive understanding of the major parasitic diseases, emphasizing epidemiology and control. Other courses deal with various aspects of parasitism, particularly the biology, immunology, molecular biology, vector biology, cell biology, and pathology associated with parasites and their vectors. Although ecological, epidemiological, political, and social aspects relevant to control of infectious agents are integrated into the teaching programs, the focus of the department's research remains primarily in the biological aspects of the host-parasite relationship.

This program, which leads to the Master of Public Health (MPH) degree, provides students trained in the health sciences with the background necessary to promote research or service careers in developing countries. It introduces students to the significance, recognition, and prevention of the major infectious disease problems of developing countries. Students satisfy basic course requirements in biostatistics, epidemiology, and tropical public health, along with other distribution requirements of the MPH program.

Students take specialized courses offered by the department according to their area of interest and future needs. In addition to the courses offered in the Department of Tropical Public Health, stu-

dents preparing for a career in international health should take courses offered by other departments, focusing on allocation of resources and on the social, economic, and political factors in public health.

Background of Applicants The MPH with concentration in Tropical Public Health is designed for persons with prior medical, dental, veterinary, or biomedical science degrees who are interested in problems of infectious diseases in developing countries.

CONCENTRATION IN THE BIOLOGY AND EPIDEMIOLOGY OF PARASITES

This program introduces students to recent advances in the area of biology and epidemiology of parasitic diseases and provides background for conducting research on these diseases. Emphasis is placed on molecular biology, immunology, cell biology, and epidemiology. In this concentration, the Master of Science (SM) degree is usually regarded as preparation for the Doctor of Science (SD) program.

Students satisfy basic course requirements in tropical public health, biostatistics, and epidemiology, and take advanced courses in this department as well as at the Harvard Medical School and at the Harvard Graduate School of Arts and Sciences. Students are expected to enroll in tutorials or to carry out laboratory research projects in addition to their formal course work. The research program emphasizes molecular biology, immunology, cell biology, and epidemiology of parasites.

Background of Applicants Students in this program have at least a bachelor's degree but can enter at any level of advanced training, including the postdoctoral level.

CONCENTRATION IN VECTOR BIOLOGY, ECOLOGY, AND CONTROL

This program introduces students to the various arthropod and molluscan vectors of human infection and develops an appreciation for the biology of these organisms and the means for their control. It prepares students to plan and evaluate control programs and develops skills with respect to identification, maintenance, and experimental procedures involving these organisms.

In addition to required courses in epidemiology and biostatistics, participants in the program take courses in vector biology, molecular biology, immunology, and parasitology. Depending upon the particular interest of each student, courses in cell biology, invertebrate physiology, pathology,

genetics, population ecology, and computer sciences may be required. The research program emphasizes experimental ecology, biochemistry, physiology, and molecular genetics.

Background of Applicants Students in this program normally have at least a bachelor's degree, but can enter at any level of advanced training, including the postdoctoral level.

Career Outlook Some positions taken by recent graduates include academic and administrative posts in programs dealing with the control of tropical, parasitic, and vector-borne diseases or with research on these entities. Posts are in the public and private sectors and at the national and international levels.

For more information Please refer to the section *Degree Requirements* for general information about the degree programs. Additional information about admission requirements and procedures can be found in the section *Admission and Registration*.

Some of the courses offered by the department are described in the section Courses of Instruction.

DIVISION OF BIOLOGICAL SCIENCES IN PUBLIC HEALTH

The goal of the Division of Biological Sciences in Public Health is to strengthen the scientific basis and application of biological knowledge and methodology to major issues of public health. To accomplish this, the division brings together faculty members and training programs from departments with strong biological components, including Cancer Biology, Environmental Science and Physiology, Nutrition, Population Sciences, and Tropical Public Health, as well as the Laboratory of Toxicology. Members of the Departments of Biostatistics and Epidemiology also share the division's goals.

Through the division, the school offers a multidisciplinary doctoral program in biological sciences in public health. The division is designed to provide training for able students committed to a career in this field who have not yet selected an area of concentration. Students are admitted to the division as candidates for a Doctor of Science degree. The degree is in the department or discipline in which the student performs thesis research. Applicants who have already chosen a field of study should apply directly to the appropriate department, rather than to the division.

Degree Program Doctor of Science

Students in the division take courses for one to two years to gain a thorough grounding in the biological sciences and in elements of the biomedical sciences and epidemiology. In the first year, students rotate for six- to eight-week periods through various laboratories and participate in division-sponsored seminars. This prepares students to make an informed choice of topic and academic adviser before embarking on doctoral thesis research, which ordinarily requires three to four years to complete.

Course requirements are flexible in order to accommodate students with diverse backgrounds and different emerging career goals. With the help of their advisers, students select a program that might include courses in biochemistry, cell biology, pharmacology, virology, immunology, genetics, pathology, and human physiology. Three courses are required:

1. A course in biostatistics which assumes some knowledge of probability and scientific inference and provides competence in the major statistical methods essential for both laboratory and epidemiological research.



*Dr. Peter Goldman,
Professor of Health
Sciences in Nutrition and
Director of the Division of
Biological Sciences in
Public Health.*

2. A course in epidemiology which presents epidemiologic methods and a systematic analysis of the health status of populations both in the United States and in other parts of the world.
3. An interdisciplinary seminar which covers the evidence and methods used to explain the biological basis for the amelioration of such health problems as arteriosclerosis, cancer, the effects of chemical and biological toxins, and infectious diseases.

Background of Applicants Applicants generally have a bachelor's degree and demonstrated competence in organic and biological chemistry, general biology, physics, and calculus. Applicants deficient in one of these areas may be admitted provisionally, on the basis that appropriate courses are taken before and/or after entry. Three letters of evaluation are required from instructors of science and mathematics, and applicants who have worked in relevant areas should also supply evaluation letters from employers. The Graduate Record Examination (GRE) is required. Applicants wishing to visit the school are encouraged to come for an interview.

Financial Aid The division provides eligible students with two years of financial support (full tuition plus stipend). Thereafter, the student is supported by the department or laboratory in which the thesis work is conducted.

For more information Please refer to the section *Degree Requirements* for general information about the Doctor of Science degree. The section *Departments and Laboratories* provides information about departmental concentrations. To find out more about the division, please write to Mary Lou Licwinko, Director of Professional Development, 677 Huntington Avenue, Boston, MA 02115, or call her at 617-732-1036.

POSTDOCTORAL AND SPECIAL PROGRAMS

■ POSTDOCTORAL FELLOWSHIPS

Some departments, particularly laboratory-oriented areas such as Cancer Biology and Tropical Public Health, offer opportunities for postdoctoral research and training. Research fellows generally work with principal investigators on continuing research projects, and may also serve as teaching assistants. Research fellows may be salaried, may be offered a tax-exempt stipend, or may be required to supply their own funding from public or private sources. For more information about postdoctoral opportunities, contact the administrator or chairman of the relevant department.

■ INTERDISCIPLINARY PROGRAMS IN HEALTH

Postdoctoral Program

Donald F. Hornig, SB, PhD, Alfred North Whitehead Professor of Chemistry in Public Health and Director of Interdisciplinary Programs in Health

The Interdisciplinary Programs in Health (IPH) grant postdoctoral fellowships to young and mid-career individuals with strong backgrounds in natural or social sciences who seek training in health fields. IPH also enlists visiting scientists and scholars from the natural and social sciences in the effort to find new ways of dealing with the critical health problems of today's society.

IPH is a university-wide program, designed to bring to health problems the knowledge, skills, insights, and analytic techniques of a variety of disciplines. Participants in IPH include members of the Faculties of Arts and Sciences, Business, Government, Law, and Medicine, as well as Public Health, where the program is based. IPH creates new cooperative links among scholars in these faculties as they work on problems relating their fields to health research.

IPH currently focuses on environmental health, with particular emphasis on scientific and public policy issues related to chemicals in the environment: Over 40,000 chemicals are now in production and more than 500 more are introduced each year, many of them biologically active. The program's activities range from laboratory studies of biochemical effects at the cellular level to risk assessments and policy analyses of the regulatory

process. Individual programs reflect the interests and wishes of the participants, who leave IPH prepared to work on health problems in federal, state, and local governments, in industry, and in research and, in some cases, to launch programs at other universities.

The program has several components. First, research may be done individually, in collaboration with existing research groups, or with new interdisciplinary teams. Second, seminars and working groups explore particular problems and develop papers and monographs. Third, fellows and visitors meet together regularly, joined by members of the Harvard faculty and distinguished guests, to exchange experiences and to discuss important issues related to health.

IPH is not a degree-granting program.

IPH FELLOWS

Postdoctoral fellowships are awarded for terms of one or two years and may be renewable for a third year. Fellows devote their initial period to orientation, exploration of opportunities, and selection of projects and advisers. Experimental facilities are available in the laboratories of existing research groups. It is expected that during the term of a fellowship a substantial investigation or analysis will be completed.

Background of Applicants Fellows are promising graduates of advanced degree programs who seek preparation for careers in which their talents can be applied to environmental health-related problems, either through fundamental or applied research or through service. Fellows are chosen from the natural sciences (chemistry, biology, biochemistry, physics, and mathematics), the quantitative analytic areas (statistics, operations research, engineering, computer science, etc.), and the social sciences (economics, sociology, public policy, law, management, etc.).

VISITING SCIENTISTS AND SCHOLARS

Visitors may be on leave from universities, industry, or public interest organizations. Applicants should submit a curriculum vitae, a list of publications, a proposal for research or study to be undertaken in IPH, and a statement of the relation of IPH to their career objectives. Stipends may be available, depending on individual circumstances and the availability of other support to the applicant.

Background of Applicants Visitors fall into two general categories: (1) Senior scientists and scholars who have made significant contributions in a discipline and now wish to apply their discipline to environmental health-related problems, and (2) individuals from government, industry, or public interest organizations who have been involved in problems of environmental health and regulation and wish to broaden their background and perspective.

■ TAKEMI PROGRAM IN INTERNATIONAL HEALTH

Research and Advanced Training Program

Lincoln Chih-ho Chen, AB, MD, MPH, Dr. Taro Takemi Professor of International Health and Director of the Takemi Program in International Health

The Takemi Program in International Health offers fellowships for research and advanced training on critical issues of international health, especially those related to developing countries. The program addresses problems of mobilizing, allocating, and managing scarce resources to improve health, and of designing solid strategies for disease control and health promotion. Through its fellowships, the program aims to contribute to institutional development and improvement of national policy in the individual's home country, and to the advancement of general knowledge. The program is named for Dr. Taro Takemi, the distinguished physician-scientist who served for more than 25 years as president of the Japan Medical Association.

The primary goals of research under the Takemi Program are to investigate how resources are allocated and used for health purposes in both rich and poor countries and to develop methods for making such choices more rational and equitable. The program also strives to promote cooperative research and comparative analysis of health policies and programs in different countries, and to study transnational causes of ill health, such as population migration and disease transmission, and air and water pollution.

Currently, the program's research focuses on a few of the world's most urgent health needs, particularly those of the developing countries, and the most effective ways to meet them. Areas of research have a strong practical emphasis and include the assessment of health technology; the structure, organization, and financing of health care; and the relationships among rapid population growth, increasing pressures on the environ-



The 1985-86 Takemi Fellows, from left to right: El-Fatih El-Samani, Tomas Uribe-Mosquera, Guy Carrin, Uriel Kitron, Stanley Samarasinghe, and Mitsuru Fujii.

ment, and health status. In all areas of research, the program emphasizes the social and cultural factors that shape a country's efforts to improve health.

Each Takemi Fellow is responsible for a specific research project. Fellows use data they bring with them, and the projects are closely linked to action programs and to the work Takemi Fellows will do after returning home. Program findings and results are disseminated widely and opportunities are sought to apply them in various settings.

Fellows also participate in the weekly Takemi seminar. As the program's teaching activity, these seminars examine the question of how to set priorities under conditions of limited resources and evolving technology. The program also sponsors one open seminar a month to discuss important issues in international health, to explore possible research themes for the program, and to educate Harvard students and faculty on the state of knowledge and research in international health.

The Takemi Program is not degree oriented, as course requirements would substantially reduce the time available for research and writing. Upon completion of the program, Takemi Fellows receive a certificate and a record of their accomplishments as participants. Takemi Fellowships are generally awarded for 10 months.

Background of Applicants Applicants for Takemi Fellowships are highly qualified young and mid-career professionals and scholars from around the world with backgrounds in public health, medicine, economics, administration, biological science, and other fields.

■ MIGRATION AND DEVELOPMENT PROGRAM

Special Doctoral Program

Oded Stark, BA, MA, PhD, Lecturer on Economics and Population and Director of the Migration and Development Program

The Migration and Development Program awards two-year fellowships for doctoral dissertation research in issues related to migration and development.

The program studies the relationships between migration and economic development, the causes and consequences of migration, and the various processes associated with it, and uses these studies to draw policy implications. Participants are reassessing the fundamental assumptions of research and public policy on migration and development. An interdisciplinary approach is used to focus on both internal and international migration.

Background of Applicants Doctoral candidates in any Harvard or MIT department who have successfully completed the necessary written examination and course requirements can be considered for a fellowship award. In particular, the program seeks to support students of high promise in the areas of economics, population studies, sociology, political economy and government, urban planning, regional studies, statistics, and public administration. Students are selected by the program's director in consultation with its faculty advisory committee, which represents the fields of economics, sociology, demography, and political science.

■ PROGRAM IN HUMAN ECOLOGY

Special Doctoral Program

Richard Levins, AB, PhD, John Rock Professor of Population Sciences and Head of the Program in Human Ecology

The study of human ecology in a public health context integrates social, historical, and ecological aspects of human existence in order to understand and influence the improvement of health in populations and communities. The Program in Human Ecology is an interdepartmental research and teaching program including faculty from the Department of Population Sciences and other areas. The program emphasizes the inseparability of biological and social components of the patterns of health and disease, agriculture, environmental protection, and resource use within a framework of complex systems analysis.

Degree candidates usually take further training in quantitative and qualitative mathematical approaches to complex systems, general and human ecology, and demography. Advanced courses relevant to each student's research interests are available as electives. These might include agricultural systems and production, population ecology, ecological anthropology, specialized courses in tropical public health, environmental sciences, and biology.

Background of Applicants Applicants are accepted into a doctoral program in one of the school's departments and must meet that department's admission and degree requirements as well as those of the Program in Human Ecology. Potential applicants should contact Dr. Levins to indicate their interest in being considered for the program.

■ PUBLIC HEALTH FOR LAWYERS

Special Master's Program

William J. Curran, JD, LLM, SM in Hyg., Frances Glessner Lee Professor of Legal Medicine and Head of the Program in Public Health for Lawyers

The dramatic expansion of legal and regulatory issues in health fields has resulted in a critical need for lawyers with formal training in the health sciences and disciplines. Growing specialty fields include hospital and health care law, personal injury and compensation law, environmental health law, occupational health and safety law, and child health law. To help meet the need for trained professionals in these areas, the Harvard School of Public Health invites lawyers to apply to its one-year Master of Public Health (MPH) program.

The MPH program provides an incisive overview of the health field while offering specialized options for professional training in a variety of areas. Lawyers may pursue a comprehensive program in the health sciences and medical care delivery, or may tailor their programs to pursue special interests, such as the following:

- Health systems regulation and planning
- Medical malpractice and risk management
- Environmental health
- Occupational health and safety
- International health
- Mental health
- Population science
- Child growth and development
- Legal medicine and death investigation
- Medical ethics and human rights

The Department of Health Policy and Management offers both a Master of Public Health (MPH) and a Master of Science (SM) degree option for lawyers. To supplement their studies in either the MPH or the SM program, students may avail themselves of course offerings in other faculties of Harvard University such as the Law School, Medical School, and John F. Kennedy School of Government.

Background of Applicants In addition to a law degree, applicants should have an aptitude for public health studies, as evidenced by undergraduate courses in relevant areas such as statistics, economics, political science, biology, psychology, and health sciences. Most applicants have been in law practice for several years, preferably in health law areas. Recent law school graduates who show special promise for health law careers are also encouraged to apply.

■ PUBLIC HEALTH FOR DENTISTS

Special Master's Program

Chester W. Douglass, DDS, MPH, PhD, Lecturer on Public Health Dentistry and Head of the Committee on Postdoctoral Education at the Harvard School of Dental Medicine

Dentists enroll in many of the degree programs at the Harvard School of Public Health, particularly in the Departments of Health Policy and Management, Epidemiology, and Maternal and Child Health, as well as in the MPH General Program. The school cooperates with the Harvard School of Dental Medicine to offer a postdoctoral fellowship program which leads to a public health degree, as described below.

Postdoctoral Fellowship Program in Dental Public Health, Epidemiology, and Dental Care Administration This program prepares individuals for creative full-time teaching, research, and administrative careers in dental public health, epidemiology, and dental care administration. Participants in the program are appointed as Clinical or Research Fellows in Dental Care Administration at the School of Dental Medicine.

The program comprises three parts of approximately one year each. One part of the program involves a formal course of study leading to a Master of Science or Master of Public Health degree. Fellows must complete the core courses in the first year at the Harvard School of Public Health, and must complete all requirements for the degree within two academic years. Candidates with an equivalent degree from another school, however, may be accepted into the program with one year advanced standing.

The second portion of the program involves a one-year supervised residency at the community, state, or national level in epidemiology or health policy and administration. This residency meets the requirements of the American Board of Dental Public Health. The third portion affords opportunity for advanced study and research at the Harvard Schools of Dental Medicine and Public Health, at other Harvard schools, and at other institutions. Fellows may carry on epidemiological or health services research over the entire three-year period in a variety of situations involving either new or continued studies. Each participant in the program prepares a research thesis for presentation at the end of the third year.

In addition to the master's degree, candidates receive a Certificate of Postdoctoral Study in Dental Care Administration and a certificate of completion of residency requirements from the Harvard School of Dental Medicine.

Background of Applicants The Postdoctoral Fellowship Program is open to dentists and other qualified health professionals who meet the admission requirements of both participating schools. Application should be made to the School of Dental Medicine, whose Committee on Postdoctoral Education will forward the applicant's file to the School of Public Health for consideration.

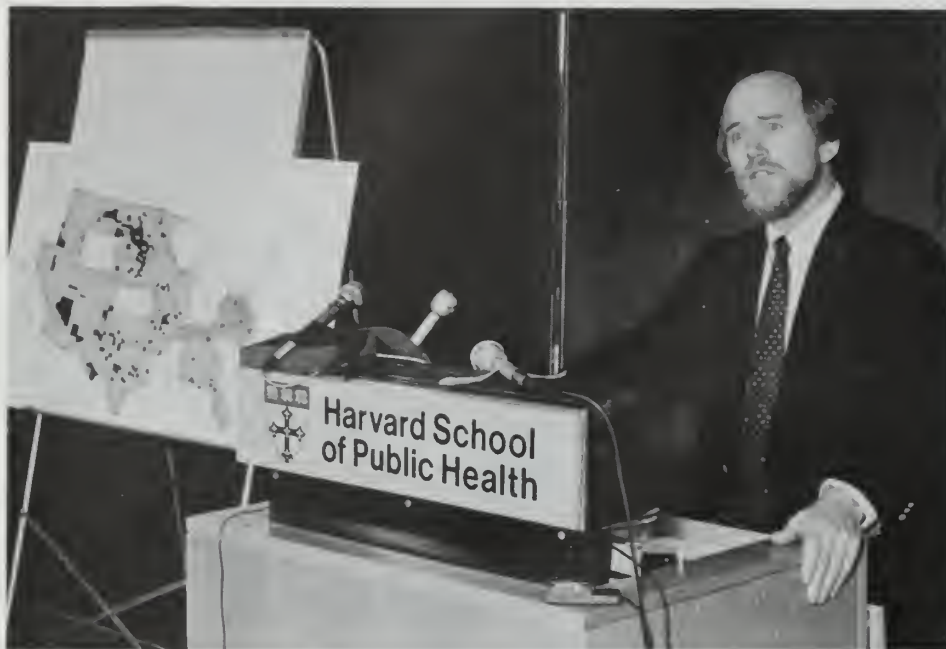
■ COMMUNITY HEALTH IMPROVEMENT PROGRAM

Special Nondegree Program

J. Larry Brown, AB, AM, PhD, Lecturer on Health Services and Director of the Community Health Improvement Program

The Community Health Improvement Program (CHIP) is a community service and policy analysis component of the Harvard School of Public Health. CHIP's objectives are to improve the health status of communities by developing, implementing, and evaluating innovative community-based public health strategies in conjunction with community agencies, and to carry out field-based research on critical public health issues as the basis for preparation of national policy reports. CHIP addresses primarily the areas of environmental health, nutrition, and hunger, and primary care for low-income and underserved populations.

The service goals of CHIP are fulfilled by students and by CHIP staff who work with community agency personnel to improve the equity, efficiency, and effectiveness of health service delivery. Participants also seek to increase the usefulness of policy-relevant information and evaluation techniques.



Dr. J. Larry Brown, Lecturer on Health Services and Director of the Community Health Improvement Program, presents research gathered on hunger in America.

CHIP demonstration and research projects are guided by more general needs for new public knowledge and understanding. These projects are developed by CHIP staff, faculty members associated with CHIP, colleagues from teaching hospitals and schools of public health across the nation, and students.

CHIP's recent undertakings and publications include *Hunger in America: The Growing Epidemic* (1985, Wesleyan University Press) and "Developing a Community Agenda to Combat Environmental Toxins," a 20-part educational videotape series.

CENTERS, INSTITUTES, AND OFFICES

The Harvard School of Public Health supplements its departmental research and teaching programs by supporting a variety of centers, institutes, and offices. These units enrich the school's intellectual environment and expand students' academic opportunities by promoting interdisciplinary study and research in population studies, environmental health, international health, and the health care system. Included among these organizations are those which carry public health issues beyond the boundaries of the school to other parts of Harvard University, to the professional community, and to the public at large.

The Office of International Health Programs aims to meet the needs of students who wish to concentrate in this important area. Some of its activities, in addition to research, include advising students, organizing special courses and events, and encouraging the development of course offerings to allow for specialization.

Some centers, such as the Kresge Center for Environmental Health, represent close alliances between two or more departments at the school with interests in a particular area of public health. Others, such as the Center for Population Studies and the Institute for Health Research, draw from an even larger pool of expertise by linking the School of Public Health with other Harvard schools and with the Boston health care community.

Two of the offices serve a broader constituency. The short courses presented through the Office of Continuing Education provide the latest information to mid-career professionals in the fields of medical sciences and management, occupational health, nuclear safety and radiation protection, environmental management, and control of indoor environments. The Center for Health Communication uses a media-based, consumer-oriented approach to provide the public with reliable health information.

Each center, institute, and office is described in more detail in the following pages.

■ CENTER FOR HEALTH COMMUNICATION

Jay A. Winsten, AB, PhD, Assistant Dean for Public and Community Affairs

Through the strategic use of mass communication, the Center for Health Communication disseminates dependable information on such topics as nutrition, stress, physical fitness, drinking and driving, drug abuse, teen suicide, teen pregnancy, and smoking.

The center is designed to exploit the public's unprecedented interest in promoting good health by communicating reliable information in a compelling way. When there is general consensus on an issue within the scientific community, the center disseminates what is known. On matters of controversy, the center aims to clarify the nature of the dispute. By improving public understanding of such matters, the center helps individuals make informed decisions.

The center reaches the public by working closely with journalists in leading news organizations. The center's activities include the following:

- Conducting seminars and publishing background reports for science reporters, editorial writers, television producers, and senior news executives to brief them on cutting-edge issues in public health
- Conducting major campaigns to achieve high public visibility for important health matters through coordinated efforts involving experts in health and in mass communication
- Issuing "white papers" to transmit important health messages to the general public through the media
- Responding to inquiries from journalists across a broad range of health issues
- Sponsoring a fellowship program, the Ivan F. Boesky Visiting Fellowships for Journalists, to provide opportunities for reporters to pursue long-term projects that promise to strengthen public understanding of science and health
- Sponsoring the Health Policy Forum, a colloquium series for the greater Boston health, business, government, and journalism communities
- Developing research and teaching components in collaboration with the school's academic departments



At left, Dr. Julius B. Richmond, former Surgeon General and Director of Harvard's Division of Health Policy Research and Education, looks on as Boston Mayor Raymond Flynn greets Dean Harvey V. Fineberg, following a Health Policy Forum on infant mortality.

The center's advisory board is chaired by former United States Surgeon General Julius Richmond, now director of Harvard's Division of Health Policy Research and Education. Other members of the advisory board are John Chancellor, NBC News senior commentator; Arnold Relman, editor of *The New England Journal of Medicine*; Frank Stanton, former president of CBS, Inc.; William J. Curran, Francis G. Lee Professor of Legal Medicine, Harvard School of Public Health; Stephen Havas, deputy commissioner of the Massachusetts Department of Public Health; Joann Rodgers, past president of the National Association of Science Writers, deputy director of the Office of Public Affairs for the Johns Hopkins Medical Institutions, and vice president of the Council for the Advancement of Science Writing; David Perlman, associate editor of the *San Francisco Chronicle* and board member of the Council for the Advancement of Science Writing; Michael Pertschuk, director of the Smithsonian's Advocacy Institute and former chairman of the Federal Trade Commission; and Howard Simons, director of the Nieman Foundation, Harvard University, and former managing editor of *The Washington Post*.

■ CENTER FOR POPULATION STUDIES

David E. Bell, AB, AM, LLD (hon.), Clarence James Gamble Professor of Population Sciences and International Health and Director of the Center for Population Studies

The Center for Population Studies was established in 1964 under the leadership of the Harvard School of Public Health as a university-wide center to join scholars and scientists in different fields in a common approach to human population problems. The members and research associates of the center are drawn from the Departments of Biology, Economics, Government, Sociology, and the Division of Applied Sciences, in the Graduate School of Arts and Sciences; and from the Schools of Public Health, Design, Divinity, Education, Government, and Medicine.

In the School of Public Health, the Department of Population Sciences welcomes qualified candidates for the various degrees offered by the school. Courses open to all qualified students are also given by members of the Center for Population Studies in other parts of the university.

The present research programs of the center and the department focus on several themes: migration and development; human reproductive biology; economic, social, and environmental causes and effects of population change in the United States and other countries, including public health aspects of fertility and the balance between populations and their resources; problems of urbanization and internal migration in both developed and developing countries; theories of population dynamics and their implications for public policy; political and ethical aspects of population policy; and the effect of nutrition and exercise on female reproduction.

■ EDUCATIONAL RESOURCE CENTER FOR OCCUPATIONAL SAFETY AND HEALTH

Richard R. Monson, SB, MD, SM in Hyg., SD in Hyg., Professor of Epidemiology and Director of the Educational Resource Center for Occupational Safety and Health

The primary objective of the Educational Resource Center is to train occupational safety and health professionals to recognize and prevent occupational injuries and disease. This training effort is directed toward the development of public health perspectives, the acquisition of skills and knowledge for prevention, and the creation of a sensitivity about the political climate in which professionals must act. Through the center's programs, teams of professionals learn to identify and prevent occupational impairments, disease, and injuries through the control or elimination of harmful occupational exposures.

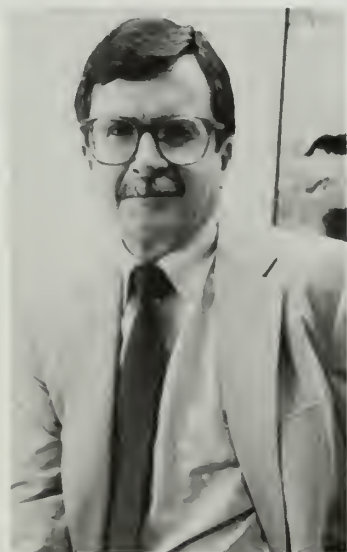
Since occupational health relies on a number of disciplines to provide the elements of prevention and problem solution, the training is multidisciplinary in nature. Descriptions of the full-time academic programs at the master's and doctoral levels are included with the departmental description of Environmental Science and Physiology. Employment opportunities exist in universities, governmental agencies, industry, and labor unions.

The center is partially supported by a grant from the National Institute of Occupational Safety and Health (NIOSH). Traineeship awards consisting of tuition, stipend, and health fee may be available on a competitive basis to qualified individuals undertaking approved training programs in occupational medicine, industrial hygiene and occupational safety, and occupational health nursing.

Decisions regarding funding are made independently from the application process. All United States citizens, noncitizen nationals of the United States, and permanent residents are automatically considered for funding.

Other facets of the center include a substantial sponsored research program spanning a variety of occupational health problems and drawing upon the expertise of scientists in many disciplines. The center offers mid-career training through short-term courses, seminars, and workshops for physicians, nurses, industrial hygienists, safety engineers, and other occupational safety and health professionals, paraprofessionals, and technicians. Many of these courses are offered through the school's Office of Continuing Education. The center also has an outreach program which networks with academic institutions, agencies, professional societies, public health departments, unions, management, and community associations within the New England region.

For further information about any aspect of the center, including student financial aid, sample curricula, and faculty research interests, contact Mr. Daryl Bichel at the Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1260).



*Dr. Richard Monson,
Professor of Epidemiology
and Director of the
Educational Resource
Center for Occupational
Safety and Health.*

■ INSTITUTE FOR HEALTH RESEARCH

Howard S. Frazier, PhD, MD, Director of the Institute for Health Research and Member of the Faculty of Public Health

Efforts to promote equity of access or to improve the quality of health care have often had unexpected, and occasionally adverse, effects on the economy, on legal institutions, and even on the effectiveness and efficiency of medical care itself. These complex and poorly understood ramifications of choices in the field of health suggest that decisions ought no longer to be considered the province of any single discipline, and that the study of many problems ought not to be left to the chance association of appropriate experts.

The Institute for Health Research (IHR) was formed by the joining together, in July 1983, of the Center for the Analysis of Health Practices of the School of Public Health and the Research Department of the Harvard Community Health Plan. The IHR's research agenda combines those of the antecedent organizations and includes interdisciplinary studies of the measures of the quality and cost-effectiveness of health care components, factors influencing the decisions of providers and patients, resource flows in the health care system, and health policy. The research output of the institute appears in books, monographs, serial publications, and discussion papers.

Members of the IHR include some 30 investigators drawn from the Harvard Schools of Public Health and Medicine, whose disciplines include the medical specialties, psychology, biostatistics, economics, policy analysis, and engineering. While the IHR itself has no teaching responsibilities, its members maintain active departmental affiliations and teach in departmental programs. Members are appointed annually by the IHR's Executive Committee. An appointment is based on the individual's interest in, and willingness to collaborate actively in, the IHR's research activities, as well as on the relevance of the individual's professional skills to the IHR's research agenda.

The IHR offers a variety of means for students to participate in its activities. Students whose dissertations concern issues in the health sector may wish to use the IHR as a resource during the development of their theses. Alternatively, a limited number of students may find opportunities to participate in IHR-sponsored research projects. Students and faculty members who do not have a formal relationship to the IHR may attend its weekly "brown bag" workshops, which serve as the major vehicle for communication among the members of the IHR and their collaborators.

The IHR receives its financial support from sources outside the university. The majority of its budget derives from research grants and contracts from governmental sources and private foundations. An important minority of its support comes as unrestricted funds from premium income of the Harvard Community Health Plan (HCHP) through the HCHP Foundation.

■ KRESGE CENTER FOR ENVIRONMENTAL HEALTH

John B. Little, AB, MD, Professor of Radiobiology and Director of the Kresge Center for Environmental Health

The Kresge Center serves as a focal point for environmental health-related research and training activities in the Harvard School of Public Health. It includes programs within departments such as Cancer Biology, Environmental Science and Physiology, and Epidemiology. Full-time faculty within the center include physicians, engineers, physiologists, mathematicians, toxicologists, chemists, and physicists. This diversity enables the staff to deal effectively with environmental and occupational health problems which require a multidisciplinary approach.

The center conducts research and training in the following areas: occupational health and safety, air pollution health effects and control, biochemical toxicology, radiation biology, radiological health (radiation protection), respiratory biology (inhalation toxicology), and environmental health engineering and management. Students interested in pursuing degree programs in these areas enroll in the relevant department of the Harvard School of Public Health. Students whose primary interest is in problems of hazardous waste, water quality, and water resources may apply to degree programs in Environmental Health Management or to the Division of Applied Sciences of the Graduate School of Arts and Sciences.

■ OFFICE OF CONTINUING EDUCATION

Dade W. Moeller, SB, SM, PhD, Professor of Engineering in Environmental Health and Associate Dean for Continuing Education

The Office of Continuing Education was established by the Harvard School of Public Health in January 1982 as an outgrowth of the Executive Programs in Health Policy and Management and the Program of Continuing Education in Environmental Health. The purposes of the office are to stimulate continuing education activities throughout the school, to provide leadership in planning new programs, and to develop innovative approaches in this field. During the academic year 1986-87, the Office of Continuing Education will coordinate the presentation of approximately 30 courses, ranging from three days to two weeks in length, with the majority covering three to five days. Subject categories covered include medical sciences and management, occupational health, nuclear safety and radiation protection, environmental management, and the control of indoor environments.

Lectures are presented by faculty members of the school, supplemented by outside experts for the coverage of special topics. Selected courses incorporate the case method, while others include laboratory sessions during which participants can practice using the latest analytical apparatus and portable field measuring instruments.

Each course qualifies for one continuing education unit for every 10 hours of classroom participation. In addition, the Harvard School of Public Health is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to sponsor continuing medical education for physicians. Selected courses have also been reviewed and approved by appropriate environmental health-related certification boards.

Participants in the courses include physicians, health care personnel, scientists, and engineers. Most of the participants are employed by federal, state, and local public health and regulatory agencies, industrial organizations, professional, trade, and public interest organizations, legislative committees, research and development laboratories, public utilities, and consultant groups. During the 1985-86 academic year, over 950 professional personnel attended courses presented under this program.



Dr. Dade Moeller, Professor of Engineering in Environmental Health and Associate Dean for Continuing Education.

The following is a list of courses scheduled for presentation during the 1986-87 academic year:

OCCUPATIONAL HEALTH

Occupational Epidemiology

June 23-27, 1986

Safety, Health and Ventilation Issues in the Laboratory

July 9-11, 1986

Certification of Biological Safety Cabinets

July 14-19, 1986

Health Effects of Asbestos: Fundamentals and Controversies

July 22-24, 1986

Advanced Topics in Occupational Health

August 4-8, 1986

Fundamentals of Industrial Hygiene

September 8-12, 1986

March 30-April 3, 1987

Industrial Ergonomics: Human Factors in Occupational Health and Safety

September 22-26, 1986

Occupational Health Management

November 16-21, 1986

NUCLEAR SAFETY AND RADIATION PROTECTION

In-Place Filter Testing Workshop

October 20-24, 1986

June 15-19, 1987

Planning for Nuclear Emergencies

June 15-19, 1987

Biological Effects of Ionizing Radiation

June 17-19, 1986

Advanced Course on Nuclear Emergency Planning

July 14-18, 1986

Occupational and Environmental Radiation Protection

August 11-15, 1986

March 30-April 3, 1987

Control of Occupational Exposures in Nuclear Power Plants

May 11-15, 1987

ENVIRONMENTAL MANAGEMENT

Risk Analysis in Environmental Health

September 3-5, 1986

CONTROL OF INDOOR ENVIRONMENTS

Safety, Health and Ventilation Issues in the Laboratory

July 9-11, 1986

MEDICAL SCIENCES AND MANAGEMENT**Program for Advanced Training in Biomedical Research Management**

June 15-27, 1986

Biological Effects of Ionizing Radiation

June 17-19, 1986

Statistical Planning and Analysis of Clinical Trials

July 21-23, 1986

Health Effects of Asbestos: Fundamentals and Controversies

July 22-24, 1986

Managing Physicians—The Relationship between Physicians and Health Delivery Organizations

August 17-23, 1986

Competitive Strategies for Health Delivery Organizations

September 14-20, 1986

Program for Health Systems Management

October 27-November 7, 1986

Program for Chiefs of Clinical Services

January 18-30, 1987

For more information To find out more about the Office of Continuing Education, please write to the office at the Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115, or call 617-732-1171.

■ OFFICE OF INTERNATIONAL HEALTH PROGRAMS

Richard A. Cash, SB, MD, MPH, Director of the Office of International Health Programs and Lecturer on Tropical Public Health

The Office of International Health Programs advises students with interests in international health in the selection of appropriate programs and courses, and coordinates international health activities within the Harvard School of Public Health.

Although the school does not offer degrees in international health per se, it does provide opportunities for preparation for teaching, research, and service in international health, with particular emphasis on problems of health in developing countries. The central methodologies—biostatistics, epidemiology, policy analysis, demographic analysis, management skills, and so on—are logically applicable to health problems in any human population. Teaching them to students from widely varying backgrounds, however, and teaching their application to countries with very different geographic, cultural, and historical circumstances, has required many modifications in curriculum and in course content. Case studies and illustrative materials from less-developed countries, for example, are included in readings and class discussions in many courses. Special courses are offered that focus primarily on less-

developed countries, including courses on parasitic and infectious diseases, on nutrition and maternal and child health in developing countries, and on health services, health planning, and program implementation in developing countries.

The process of adapting the curriculum to the needs of students interested in international health is an ongoing one, and at any time there may be some specialized demands that the school cannot meet. It is important, therefore, that students interested in international health consult with the Office of International Health Programs to be sure they are aware of all the alternatives available and plan the use of their time at Harvard to maximum advantage. In addition to the courses regularly available in the school, special tutorials can be arranged where the interests of students and faculty members coincide. Moreover, relevant courses are offered in other parts of Harvard University and at MIT. Cross-registration opportunities are available for students interested in medicine, economics, public administration, education, anthropology, government, social relations, and related subject areas appropriate to particular regions of the world. (Students may also cross-register for courses in foreign languages, but may not apply credit for such courses toward degrees being earned at the school.)

Faculty members active in international health programs have had experience in Latin America and the Caribbean, Africa, Asia, and the Middle East. They are drawn from various departments and schools throughout the university, giving international health an interdisciplinary orientation. Students at the Harvard School of Public Health come from more than 40 different countries.

Field-Based Epidemiology in Mexico City

During the summer of 1987, Dr. Richard A. Cash will lead a four-week noncredit course in Mexico City on the use of surveillance techniques and their practical application in a field situation. Modules will be offered on methodology, nutrition, vaccine-preventable diseases, and epidemiology for better management. Opportunities for individual research may be available. The course will meet eight hours a day, five days a week. Permission of the instructor is required, as is fluency in Spanish. Enrollment is limited to ten students. For more information, please contact the Office of International Health Programs, Harvard School of Public Health, 665 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1076).

ADMISSION AND REGISTRATION

■ ADMISSION

APPLICATION FOR ADMISSION

Applicants or potential applicants who have questions about admission requirements, degree programs, or any other aspect of applying to or enrolling in the school should contact Mary Lou Licwinko, Director of Professional Development, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1036).

Application forms for admission to all degree programs and for special student status can be obtained from the Admissions Office, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1030).

The section *Degree Requirements* and the departmental descriptions in this *Register* discuss some of the requirements for admission to particular degree programs. In addition to meeting these requirements, applicants must satisfy the school's Committee on Admissions and Degrees as to their ability to undertake graduate study. The final decision as to the admissibility of an applicant rests with this committee.

Applicants may apply to one degree program and one specialty area only.

Admission of a candidate is for a particular year; if enrollment at that time is not possible, reapplication is necessary and will be considered on the same competitive basis as a new application. Exceptions must be approved by the Committee on Admissions and Degrees.

Application Deadlines Applicants may submit their completed applications and all supporting documentation by *November 1, 1986*. These early applications will be reviewed and acted on in November and December. Additional applications will be accepted through *February 1, 1987*, with action to be taken in February and March. Applications received from February 2 through May 1 will be accepted for consideration for programs that have not been filled in the November and February reviews.

Application, Supporting Documentation, and Application Fee In completing the application, it is important to refer both to this *Register* and to the detailed instructions accompanying the form.

Applicants must submit the following application materials by the deadline date:

- A completed application form, application file card, and mailing labels
- Official transcripts of academic records at colleges, graduate schools, and/or professional schools, with certification of degrees conferred
- Letters of recommendation from at least three people who are well acquainted with the applicant's previous academic work and experience
- Scores of the Graduate Record Examination (GRE) or other standardized test, if applicable (see *Standardized Tests*, following)
- Scores of the Test of English as a Foreign Language (TOEFL), if applicable (see *International Students*, following)
- A nonrefundable application fee of \$40 in the form of a check drawn on a bank in the United States, a postal money order, or an international money order payable to the Harvard School of Public Health

Applicants are responsible for assuring that the official transcripts, letters of recommendation, and test scores are received by the school. All materials submitted become the property of the Harvard School of Public Health.

Tuition Deposit Admitted applicants submit a \$100 tuition deposit when confirming admission. This deposit is credited to the fall term bill and is not refunded if the student fails to register.

Policy of Nondiscrimination The policy of Harvard University is to make decisions concerning applicants, students, faculty, and staff on the basis of the individual's qualifications to contribute to Harvard's educational objectives and institutional needs. The principle of not discriminating against individuals on the basis of race, color, sex, sexual orientation, religion, age, national or ethnic origin, political beliefs, veteran status, or disability unrelated to job or course of study requirements is consistent with the purposes of a university and with the law. Harvard expects that those with whom it deals will comply with all applicable antidiscrimination laws.

Increasing numbers of students with disabilities are enrolling at Harvard and are participating in a wide range of programs and activities. Every effort is made to meet special needs. There are, however, no separate academic programs for either the



physically handicapped or for students with learning disabilities; all enrolled students undertake the same program. At the Harvard School of Public Health, the Director of Student Affairs assists handicapped students and employees in adapting to life at the school.

STANDARDIZED TESTS

Applicants may be required to submit scores from the Graduate Record Examination (GRE) or other standardized test, as follows:

- **Department of Health Policy and Management** All applicants are required to submit scores from the GRE, the Dental Admission Test (DAT), the Graduate Management Admission Test (GMAT), or the Medical College Admission Test (MCAT), as appropriate to the applicant's background. Lawyers may submit scores of the Law School Admission Test (LSAT) for the master's programs only.
- **Laboratory of Toxicology** All applicants are required to submit scores from the GRE.
- **Division of Biological Sciences** All applicants are required to submit scores from the GRE.
- **Department of Environmental Science and Physiology: Occupational Health Nursing** All applicants to this program are required to submit scores from the GRE and from the Miller Analogies Test.
- Applicants to all other programs who do not have a prior doctoral degree are required to submit scores from the GRE.
- Applicants to programs which do not require test scores who have a prior doctoral degree are urged to submit scores from the GRE, DAT, LSAT, or MCAT.

Applicants are advised to take the GRE (or other test, as appropriate) no later than the December test administration date. When test scores are

required, the school must receive an official score report from the Educational Testing Service before final action can be taken on an application. Scores may be no more than five years old.

Additional information concerning the standardized test requirement is included in the instructions accompanying the application form.

INTERNATIONAL STUDENTS

Language Proficiency Applicants from countries in which the language of instruction is not English must satisfy the Committee on Admissions and Degrees as to their ability to speak, read, write, and understand the English language. Only students who have shown evidence of academic excellence, who can understand rapid, idiomatic English, and who can speak, write, and read English with a high degree of facility should apply for admission.

Students are advised that they may be required to attend ten or more classes each week and to write papers and frequent short examinations. The school requires that all students maintain a minimum grade point average of 2.70 (B-) for graduation, and some programs have more restrictive standards. No allowance is made for students whose English is not sufficient for these demands; therefore, any deficiency must be made up before admission.

Test of English as a Foreign Language (TOEFL) All students applying from countries where English is not the language of instruction must submit scores for the TOEFL. The TOEFL score may be no more than two years old.

A TOEFL score of 550 or above is required for admission to a degree program. Applicants from abroad may be admitted to special student status with a TOEFL score of less than 550 (see *Special Students under Admission to Nondegree Status*, below). However, they may be advised to enroll in an English course while they are taking courses at the Harvard School of Public Health.

Applicants are urged to take the test as early as possible (no later than the January test date), since *applications will not be considered without the TOEFL score*. The TOEFL is administered four times a year at centers throughout the world. Information regarding registration, testing locations, and test administration dates may be obtained by writing to TOEFL Services, CN 6151, Princeton, NJ 08541-6601.

Financial Certification Before the immigration form needed to obtain a visa can be issued, foreign nationals applying for admission from outside the United States must provide certification of their

financial resources. Unless their financial support is guaranteed by an official United States agency or foundation, applicants must submit proof to the school that they have sufficient funds available in United States currency to pay the expenses for the full period of their academic program, and that they are permitted to exchange or export these funds.

In addition to providing this certification, international students wholly supported by personal funds, family funds, or sponsor's funds which are given directly to them are required to deposit certain amounts in the United States. Funds adequate to cover the first semester's tuition, fees, and living expenses must be deposited in an escrow account in a bank in New York, NY or Boston, MA. Funds adequate to cover the second semester's tuition, fees, and living expenses must also be deposited in a bank account either in the United States or in the student's home country. Before the immigration form can be issued, an official letter stating the amount in United States dollars must be sent directly from the bank to the Admissions Office for each account.

Foreign nationals already residing within the United States are also required to submit proof of sufficient funds to cover their expenses for the full period of their academic program. These students will not be permitted to register at the school unless they have adequate funds to cover the cost of tuition in an escrow account in a United States bank.

An estimate of living expenses in the Boston area is included in the section *Expenses and Financial Aid*.

Academic Credentials The school must receive official transcripts of all academic records presented for admission. These transcripts must bear the institution's official seal, and must be placed in a sealed envelope which is signed across the seal by the proper authority. For more information about this requirement, please refer to the instructions accompanying the application form.

Employment International students who hold an MD degree and either an F-1 or J-1 visa under the sponsorship of Harvard University are not permitted to accept any employment for which an MD degree is a prerequisite while in this country. In addition, spouses of students are not automatically granted J-2 work permits; they should not expect to receive such a permit during the first six to twelve months after they enter the country.

Hospital Insurance All nonimmigrant students from abroad are required to enroll in the Harvard Blue Cross/Blue Shield student insurance plan.

There can be no exception to this requirement. For more information about the plan, please refer to the section *Expenses and Financial Aid*.

ADMISSION TO NONDEGREE STATUS

Certain individuals are permitted, as a courtesy or by application, to study at the school while in non-degree status. The three categories of nondegree student are Harvard faculty and staff, Harvard affiliates, and special students. In each case, enrollment in courses is subject to the availability of space and the permission of the instructor; in courses with limited enrollment, preference is generally given to degree candidates. Payment in each case is not refundable and is due prior to or at the time of registration. Admission to nondegree status carries with it no commitment to accept the student as a degree candidate.

Harvard Faculty and Staff Persons holding Harvard Corporation appointments of at least half-time teaching faculty are permitted to enroll in courses at the school with the permission of the instructor and the registrar. Harvard staff should consult the Personnel Office about the provisions of the Harvard Tuition Assistance Plan. Harvard faculty and staff may take a maximum of five credit units per term.

Harvard Affiliates Full-time employees of an institution affiliated with Harvard who hold at least a bachelor's degree may apply for affiliate status. Applicants admitted to affiliate status may take no more than five credit units per term and ten credit units in total. Affiliates are not admitted to audit courses. Applications for admission to affiliate status can be obtained only by coming in person to the Admissions Office.

Special Students Procedures and requirements for the admission of special students are the same as for degree candidates, and in general, special student status is governed by the same policies that apply to all matriculated students. (One exception is that foreign students may be admitted to special student status with a TOEFL score of less than 550.)

Applicants should specify on the application form the courses they plan to take. Special students are not admitted to audit courses. Those enrolled less than full time are not permitted to cross-register into other Harvard schools or MIT. Special student status is limited to one academic year. Special students who wish to be admitted to degree candidacy must reapply and will be considered on the same basis as other applicants for admission.

Retroactive Credits Applicants to degree programs who have previously taken courses at the school while in nondegree status may, at the time

of their application, petition to count up to ten credits retroactively as part of the academic credit requirements. These courses must have been taken within three years of the date of entrance into the degree program and cannot be or have been counted toward any other degree at this school or at any other school. Applicants who were cross-registered at the Harvard School of Public Health while enrolled at another Harvard-affiliated school must include with their petition an official transcript from the other school as well as a letter from that school's registrar stating that the courses taken at the School of Public Health have not been counted toward a degree. A request for retroactive degree credit must be approved by the department or program with which the student is affiliated and by the Committee on Admissions and Degrees. Permission may be granted if the courses fit into the applicant's academic program. Tuition credit will not be given for previous course work, and students are expected to meet full tuition requirements for the degree.

■ REGISTRATION

ACADEMIC YEAR

The academic year at the Harvard School of Public Health is divided into two terms, or semesters. The fall term begins in mid-September and the spring term begins in early February. Each term is divided into two periods: "a" and "b" in the fall term, and "c" and "d" in the spring term. Between the terms, in January, a week of field work and special projects is called "e" period. There is a similar period during March recess called "f" period. The *Academic Calendar*, which gives term dates, recess periods, holidays, and so forth, is printed in the front of this *Register*.

REGISTRATION PROCEDURES

Every degree candidate is expected to register until the requirements for the degree are fulfilled or until degree candidacy is terminated. Every resident student, whether full time or part time, must register in person at the beginning of each term.

Fall registration is held during the week prior to the first day of classes. Registration dates and deadlines for fall and spring terms are listed in the *Academic Calendar* in the front of this *Register*. Students cross-registering into other schools must meet the deadlines set by *both* the School of Public Health and the school offering the course. A fee of \$25 per week is charged for late registration.

To complete registration, each student must file a study card with the registrar's office. Study cards

must be submitted in person and may not be submitted by persons other than the student without special permission from the registrar. Students who wish to take courses jointly offered by the School of Public Health and other Harvard schools must register for these courses at the School of Public Health. Students who wish to cross-register for a course offered by another school must obtain a cross-registration petition from the registrar's office at the School of Public Health and take it to the registrar's office of the school offering the course.

INTERNATIONAL STUDENTS

All international students must report to the Harvard International Office, 1350 Massachusetts Avenue, Cambridge, MA, at the beginning of their first term at the school and at the beginning of each academic year thereafter. There they must present their passports and entry permits or other evidence of their immigration status. This requirement applies to all students who hold an F-1 student visa, a J-1 exchange visitor visa, or permanent resident status.

COURSE LOAD REQUIREMENTS

Full-Time Students Students must take a minimum of 40 credit units for the year to be registered as full time. Students normally take 20 units per term.

However, a full-time student may take a minimum of 15 units in a term, with a minimum of 5 units in any one period, and may register for a maximum of 25 units per term. To take more than 25 units in a term, a student must submit a petition to the Committee on Admissions and Degrees at the time he or she files the study card. Full-time students who take more than 40 units in a year are not charged additional tuition.

Students in the two-year, 80-unit Master of Science program must take a minimum of 40 units in the first year and 35 units in the second year. Students who take more than 40 units in the first year may carry over only 5 units into the second year. In other words, the 80-unit requirement may be met by taking 45 units the first year and 35 the second year.

Students who are accepted into two consecutive one-year programs (40 credit units each) and who are awarded one degree at the end of the first year must fulfill the requirements for a one-year (40-unit) program during the second year. Credit units may not be carried over from the first program into the second.



Registrar and Director of Admissions Judith Hull advises Donald Ohuoha, a student in the Master of Public Health program.

Persons in a 60-unit master's degree program must follow the guidelines for students in an 80-unit degree program, except that all 60 units must be taken within three consecutive terms.

Half-Time Students Half-time students generally complete a one-year program in two academic years. A regular program for half-time students consists of 10 credit units per term, although they may register for a minimum of 7.5 and a maximum of 12.5 units per term for a total of 20 units per year. Units over 25 per year are assessed an additional tuition charge of \$240 per unit; tuition paid for units over 25 per year may not be applied toward total tuition requirements (see *Expenses and Financial Aid*). Half-time students wishing to take more than 25 units per year must petition the Committee on Admissions and Degrees for approval, in addition to paying extra tuition for the additional units.

Part-Time Students The Committee on Admissions and Degrees occasionally permits students to register as part-time degree candidates. These students must complete a two-year, 80-unit program in three academic years; ordinarily, this requires at least half-time attendance. Tuition is charged at the full-time rate for the first year and at the half-time rate for the following two years. Students in a two-year program desiring any other credit unit/program arrangements must submit a petition to the Committee on Admissions and Degrees for approval.

EXPENSES AND FINANCIAL AID

■ EXPENSES

TUITION AND FEES

Tuition and fees for the academic year 1986-87 are as follows:

Degree Candidates

Full-time resident tuition	\$9,950*
Half-time resident tuition (up to 25 credit units per year)	5,150*
(Credit units over 25 are charged \$240 per credit.)	
Doctoral full-time reduced tuition	5,150*
Doctoral half-time reduced tuition	2,750*
Doctoral facilities fee (resident)	1,550*
Nonresident guidance fee (less than half-time)	600
(To defer a loan, nonresidents must request that the facilities fee be charged.)	

Leave of Absence

Active file fee for each term student is on leave	50
---	----

Special Students

Enrolled for 10 or more credit units:

Tuition as stated above for full-time or half-time students.

Enrolled for 6 to 9 credit units:

First credit unit per term	415*
Each additional credit unit per term	240

Enrolled for 1 to 5 credit units:

Per credit unit per term	240
--------------------------	-----

Summer Session

Five credit unit summer program for degree candidates who register and receive credit for research or supervised study during summer session	1,200
--	-------

Dissertation Fee

Final doctoral tuition fee for November and March graduates. (For the registration period in which a dissertation is formally approved and accepted by the department and the Committee on Admissions and Degrees, a June doctoral degree candidate must pay at least half of the current facilities fee.)	390
--	-----

Medical Insurance

Blue Cross/Blue Shield, billed separately (This is compulsory for nonimmigrant foreign students.)	370
---	-----

Late Fees

Late registration fee	25
Late study card fee	25/week

Drop/Add Fee

Within published deadlines: per petition	10
After published deadlines: per petition	30

* Starred amounts include the unwaivable University Health Services fee.

FINANCIAL CLEARANCE

Degree Candidates The filing of a study card is necessary to complete registration. The registrar's office will not accept a study card from a student who is not financially clear. To be considered financially clear, students must pay all past charges due the university and must take one of the following actions toward payment of the current term's tuition and fees:

- Pay the current term's charges in full.
- Enroll in the monthly payment plan. This allows students to pay one-quarter of the term's charges at the time of registration and to spread the rest of the payments over the next three months. Students can sign up for the plan at the Student Term Bill Office, Holyoke Center third floor, Cambridge. The fee for this service is \$25 per term.
- Obtain documentation from the school's financial aid office that loans are in process which will cover the term's full tuition and fees. Students with loans pending are allowed to register conditionally until the loan acceptances are available for signature.
- Provide documentation that tuition and fees are being directly billed to and will be paid by a sponsoring organization.

Any student whose indebtedness to the university remains unpaid on the date fixed for payment may be deprived of the privileges of the university. Reinstatement is obtained only by consent of the dean of the school in which the student is enrolled.

Nondegree Students Harvard faculty and staff, Harvard affiliates, and special students enrolled for less than 10 credits must pay all tuition and fees for the term in full when they register. Payment is not refundable.

Billing Address Term bills are sent to a student's local address unless the Student Term Bill Office is requested in writing to send them elsewhere.

TUITION REQUIREMENTS

After admission to the Harvard School of Public Health (HSPH) and until fulfillment of the requirements for the degree, all degree candidates must be registered continuously in one of the following registration categories:

- Resident students
- Nonresident doctoral students
- Students on leave of absence

Degree candidates must pay full tuition for a designated number of years, depending on their degree program and their previous affiliation with the school. All degree candidates must pay the appropriate tuition rate for each registration period as outlined on the *Tuition and Fees* schedule; tuition may not be paid on a “per credit” basis, except for half-time degree candidates who take over 25 credit units for the year. Any degree candidate who registers for less than full time must in any event fulfill the full-time, full-tuition requirements for the degree. Tuition for summer school courses and additional tuition paid for credits over 25 per year may not be credited toward any tuition requirements for the degree.

Resident Students All degree candidates who are enrolled in courses or who intend to use any Harvard academic facilities must register as resident students. *Master’s degree students* pay full tuition for the entire period in which they are in full-time attendance.

The tuition requirements for resident *doctoral students* are as follows:

1. Students who have not previously attended HSPH pay a minimum of two years of full tuition and one year of reduced doctoral tuition.
2. Students who have received a one-year master’s degree from HSPH within three years of enrolling in a doctoral program in the same discipline pay a minimum of one year of full tuition and one year of reduced doctoral tuition.
3. Students who have received a two-year master’s degree from HSPH within three years of enrolling in a doctoral program in the same discipline pay a minimum of one year of reduced doctoral tuition.
4. Students who have received a Master of Public Health degree and a Master of Science degree from HSPH within three years of enrolling in a doctoral program in the same discipline as one of their HSPH master’s degrees pay a minimum of one year of reduced doctoral tuition.
5. In the year(s) following the year in which reduced doctoral tuition is paid, students pay only the facilities fee. This fee enables students to use Harvard academic facilities and the University Health Services.

Nonresident Doctoral Students Doctoral students who no longer reside within a 50-mile radius of Boston, who are engaged in less than half-time work on the degree, and who have received permis-

sion from their department and the Committee on Admissions and Degrees (CAD) to pursue a portion of their program as a nonresident, are charged the nonresident guidance fee. Students in this category normally have completed payment of at least the required two years of full-time tuition and one year of reduced doctoral tuition before applying for nonresident status; they must in any case complete this payment prior to their graduation and will be billed accordingly while in nonresident status.

The nonresident guidance fee covers periodic consultation with the student’s doctoral adviser but does not provide for the use of Harvard facilities or for the issuance of a Harvard identification card. Also, students registered for less than a half-time program may not qualify for deferment of an educational loan. Upon expiration (or earlier termination) of CAD permission for nonresident status, or for a term in which use of Harvard facilities is required, the appropriate resident rate will be charged.

Students on Leave of Absence Degree candidates who will not, during a given registration period, be engaged in study or research for a degree from the school, and who will be making no use of Harvard facilities, must apply for a leave of absence. Students on leave of absence are required to pay the active file fee to maintain their degree candidacy. Upon expiration or earlier termination of the leave of absence, students are charged the appropriate tuition rate.

STUDENT HEALTH INSURANCE

University Health Services University Health Services (UHS) provides comprehensive prepaid medical care such as physical examinations, physician visits, laboratory tests, and psychological counseling. Students may establish a relationship with a particular UHS physician and may use the drop-in clinic for acute medical and surgical situations. Payment of the University Health Services fee is compulsory for all students enrolled for at least 6 credit units per term.

Blue Cross/Blue Shield The Blue Cross/Blue Shield (BC/BS) medical insurance plan, charged separately from the University Health Services fee, covers the costs of many types of medical care not offered at University Health Services. Students may enroll in the plan in September or January, and coverage extends through August 31. A descriptive brochure about the BC/BS plan is included with the fall registration materials.

Students are automatically enrolled in the BC/BS plan. This insurance is compulsory for all nonimmigrant students from abroad. It is also required for all other students who do not have comparable insurance and for postdoctoral research fellows and teaching fellows in training status who do not have comparable insurance.

United States students and fellows who have comparable medical insurance and who would prefer not to enroll in BC/BS must submit a waiver form by September 30 (for the fall term) or February 11 (for the spring term). *Students who fail to file waivers will be responsible for any fees billed for that term.* Waivers for BC/BS insurance are approved *only* by the Director of the University Health Services.

Nonresident doctoral students are not automatically enrolled in any Harvard health plan. Those who wish to have BC/BS insurance coverage must file special forms with the Harvard Student Insurance Office by September 30 (for the fall term) or February 11 (for the spring term). Coverage is optional for students who are residing outside the United States. However, BC/BS insurance is mandatory for all international students in nonresident status *within* the United States.

A BC/BS plan for spouses (including maternity benefits) and children of full-time students is also available. As the plan provides extensive benefits for ambulatory and inpatient care, all who are eligible are strongly advised to enroll.

FIELD STUDIES

Field opportunities, listed under each department's course offerings and bearing the course number 330, often entail travel expenses that must be met by the student. Information about estimated expenses should be obtained from the appropriate department.

LIVING EXPENSES

Living costs in the Boston area are higher than in many other parts of the United States. The table below lists minimum estimated amounts that students will need in the academic year 1986-87 to cover expenses for 9 or 12 months. Applicants who plan to enroll in a two-year program should allow for a four to six percent increase for the academic year 1987-88.

Harvard School of Public Health
Estimated Minimum Expenses for the 1986-87 Academic Year

	<i>Single</i>		<i>Married</i>		<i>Married; One Child</i>	
	<i>9 mos.</i>	<i>12 mos.</i>	<i>9 mos.</i>	<i>12 mos.</i>	<i>9 mos.</i>	<i>12 mos.</i>
Living Expenses						
Rent/Utilities ¹	\$3,900	\$ 5,200	\$ 5,625	\$ 7,500	\$ 6,300	\$ 8,400
Food	1,620	2,160	3,240	4,320	3,960	5,280
Personal ²	3,060	4,080	5,400	7,200	6,300	8,400
Transportation ³	540	720	900	1,200	900	1,200
	<u>\$9,120</u>	<u>\$12,160</u>	<u>\$15,165</u>	<u>\$20,220</u>	<u>\$17,460</u>	<u>\$23,280</u>
Educational Expenses						
Books/Supplies	600		600		600	
Loan Fees	500		500		500	
Health Insurance (student)	370		370		370	
Family Health Insurance			1,565		1,565	
Tuition ⁴	9,950		9,950		9,950	
	<u>\$11,420</u>	<u>\$11,420</u>	<u>\$12,985</u>	<u>\$12,985</u>	<u>\$12,985</u>	<u>\$12,985</u>
Total Expenses	<u>\$20,540</u>	<u>\$23,580</u>	<u>\$28,150</u>	<u>\$33,205</u>	<u>\$30,445</u>	<u>\$36,265</u>

Notes:

¹Because of the influx of students, apartments can be difficult and expensive to find in September. It is not uncommon to have to pay up to 4 months rent to secure housing; first and last months' rent, security deposit, and rental agent fee. Students unable to live in university housing may also have to furnish, at least minimally, an apartment.

²Students from warmer climates should consider the cost of buying warm clothes for the winter.

³This amount excludes relocation costs and transportation home for vacation since costs can vary greatly.

⁴Based on full-time first-year tuition and will be adjusted for other registration status.

■ FINANCIAL AID

APPLICATION FOR FINANCIAL AID

Application forms for all types of financial aid can be obtained from the Financial Aid Office, Harvard School of Public Health, Room G-4H, 677 Huntington Avenue, Boston, MA 02115 (telephone 617-732-1867). Detailed instructions are included with the form.

Applications for financial aid will be processed in two batches. Candidates who have been accepted for admission to the school and whose financial aid applications are complete by *February 1, 1987*, will be informed of their awards soon after February 15. The second batch of applicants will comprise those who have been accepted to the school and whose financial aid applications are complete after February 1 but by *March 15, 1987*; they will be notified of their awards shortly after April 1. Applicants who were considered with the first batch but who were not awarded financial aid will be considered again with the second batch. Since grant funds are limited, there is no guarantee funds will be available after March 15.

Application Form and Supporting Documentation United States citizens and permanent residents applying for financial aid must submit the Institutional Application for Financial Assistance, whether they are applying for *school* funds or for *departmental* funds. Applicants for school funds must also submit the following:

- Completed and processed Graduate and Professional School Financial Aid Service form (GAPSFAS)
- A copy of the applicant's 1986 federal income tax return, for educational loans and the College Work-Study Program
- A copy of the applicant's alien registration card, for permanent residents

SOURCES OF FINANCIAL AID

Financial aid at the Harvard School of Public Health comes from several sources. United States citizens and permanent residents are eligible to apply for grants, loans, and work-study programs. International students may also be eligible for financial assistance, as described at the end of this section.

Grants Some departments have training grants that may provide up to full tuition and a stipend. Eligibility for these grants is based on career goals, merit, and/or financial need. Applicants should contact the administrator of the department to which they seek admission for further information on available departmental grants.



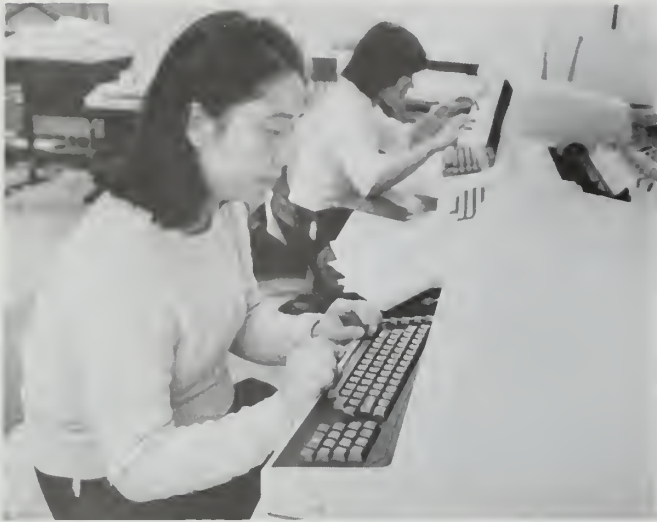
Associate Dean for Students, Dr. R. Heather Palmer, addresses students at fall orientation.

Students who do not receive grant support from a department and who have demonstrated financial need may be eligible for grants administered by the financial aid office. In the past, funds have been available to provide a limited number of grants ranging from half of tuition to full tuition. Several grants are reserved for incoming minority students.

Loans To supplement other financial aid, many students borrow through one or more of the federal education loan programs. United States citizens and permanent residents are eligible to apply for Guaranteed Student Loans (GSL), PLUS Loans, National Direct Student Loans (NDSL), and Health Education Assistance Loans (HEAL). It is generally suggested that students apply for a \$5,000 GSL, supplemented by one of the other loan programs. Harvard University is a lender of GSL, NDSL, and PLUS, but students with outstanding loans from banks should consider reapplying through these same lenders. The Harvard School of Public Health has established a maximum of \$30,000 on the total amount of outstanding loan debt a student may owe upon entering and while attending the school.

College Work-Study Program College Work-Study is a federally funded program which provides eligible students with financial support to facilitate obtaining employment in public and private nonprofit organizations. Eligibility is based on financial need, full-time status, and availability of funds.

Scholarships Harvard University's Committee on General Scholarships and the Sheldon Fund administers a number of scholarships that are open to applicants from all schools of the university. Eligibility for many of these funds is very specific and varies according to the terms of the donors. Candidates from the Harvard School of



Public Health do not apply directly for these scholarships, but must be nominated by the director of financial aid; please contact the director for more detailed information.

Grants for International Students A small amount of grant aid may be available for international students, who must be nominated by their department for consideration by the financial aid office. If nominated, international students will be asked to provide verification of their need for financial assistance. Nominations for international student grants must be complete by February 1, 1987, for consideration with the first batch of applicants, or March 15, 1987, for consideration with the second batch. Students should contact their department chairpersons for information.

POLICIES

Contingencies Retention of awards and loans is contingent upon the maintenance of at least the minimal acceptable grade point average and the required number of credit units.

Defaults Applicants should be aware that the Harvard School of Public Health views the issue of defaulted education loans as a very serious matter. According to federal regulations, students in default are ineligible to borrow through any federal education loan program or to participate in the College Work-Study Program. Students are also ineligible to receive any institutional support from the Harvard School of Public Health.

Policy of Nondiscrimination The policy of non-discrimination described under *Admission* holds for financial aid decisions as well.

COURSES OF INSTRUCTION

In the course listings, course numbers from 100 to 199 indicate undergraduate and graduate courses; numbers from 200 to 299 indicate primarily graduate courses; and numbers from 300 to 399 indicate graduate courses of reading and research.

The letters "a," "b," "c," "d," "e," and "f" following the course number indicate the period(s) in which a course is given, with "a" denoting first period and "b," second period (fall); "c," third period and "d," fourth period (spring). The letters "e" and "f" indicate supervised special studies or field observations, usually during the one-week period between fall and spring terms or during the week of spring recess.

The credit assignment is given in units following the statement of number and length of sessions per week. Credit units are assigned on the basis of the total amount of time required by a course, both class time and outside preparation.

Course titles in bold type are often followed by titles and numbers in roman face (enclosed in parentheses). This indicates that the course is also listed in other Harvard catalogs, such as Arts and Sciences, and that the course credit is provided through that faculty as well as through the School of Public Health, e.g., POP 209ab (Biology 195).

Every effort is made to ensure that the following list of courses is complete and accurate at the time of publication. However, the school reserves the right to make changes in the courses, instructors, and requirements announced in this *Register*.

The listing of courses in this *Register* implies no guarantee that a student will in fact be able to enroll in all courses of interest to that student. The course schedule is arranged insofar as possible to accommodate school and departmental requirements. However, students may encounter scheduling conflicts, particularly with electives and with courses offered in other faculties. Students should also be aware that they must satisfy any prerequisites listed in a course description before they will be permitted to enroll in that course. Courses may be dropped from the schedule at the discretion of the instructor if less than five students enroll.

■ INTERDEPARTMENTAL COURSES

ID 209a. Health Services in Developing Countries

Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Cash, Dr. Koch-Weser.

Provides a broad overview of health and health care problems in developing countries. Central issues include ecologic, environmental, and other characteristics of developing countries affecting health; analysis of their health problems, the alternative approaches to solving them, the policy and planning issues in applying solutions, and the organizational alternatives for utilizing health resources; the nature, composition, and training of the health team for use at the local and district levels; and the relation of health to development and the position of health in national planning priorities. Case studies are extensively used with student teams proposing solutions to the problems. Preference given to students who have previously been involved in international health activities.

ID 210d. Introduction to Educational Design in Health Fields

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Koch-Weser, Dr. Vanderschmidt.

An introductory course designed for students preparing for careers in the education of health professionals. Provides a systematic approach to instructional design through a model program which includes analysis of professional responsibilities and performance, specification of educational objectives, design of instructional activities, and evaluation of the educational process and outcome. Examples are drawn primarily from the fields of community medicine and public health.

ID 211c. Vaccines: Past, Present, and Future

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Essex, Dr. Walsh.

Covers methodology for new vaccine development, human trials, manufacturing and quality control, techniques to ensure appropriate use of vaccines, liability issues, cost-effectiveness analysis, and decision analysis regarding vaccines for future research, development, and distribution.

ID 212c. Biomedical Writing

Seminars. *One 2-hour session each week. 2 units.* Dr. Chernin.

Writing scientific papers is an integral part of the research process. This course develops practical skills and experience in planning and writing articles that meet the

editorial demands of biomedical journals. The salient elements of a well-prepared article — logical organization, clear and concise scientific prose, and understandable tables and figures — are emphasized by criticizing short papers written by the participants on biomedical subjects of their own choice.

Enrollment limited to 10 students and requires approval of the instructor at least two weeks before the quarter begins. This course will be given pass/fail.

ID 214c. Cultural Dimensions of International Health: Practical Applications for Health Planning

Lectures, case studies. *Two 2-hour sessions each week. 2.5 units.* Dr. Weiss.

Introduces students to the important and complex effects of culture on health and health care. Develops a systematic method to guide planners in designing culturally informed health services. Considers how the local and larger cultural contexts mediate the effects of power relationships and political and economic forces that affect health and health care.

ID 215cd. Advanced Seminar in Law and Public Health

Lectures, discussions, student presentations. *One 3-hour session each week. 5 units.* Dr. Mariner, Guest Lecturers.

Provides an opportunity for law-trained students in the public health for lawyers curriculum option and other qualified students to work together and exchange experiences in application of legal issues to current public health problems. The seminar will be the focus for a legal research paper on a topic of health law mutually determined by student and instructor. Legal issues will concentrate on matters of importance in representing health organizations in governmental and private sectors. Enrollment subject to approval of the instructor.

ID 216cd. Health Aspects of Nuclear War (HMSC-PMCE 709)

Lectures. *Two 1-hour sessions each week. 2.5 credits.* Dr. Abrams, Dr. Lown, Dr. Mack.

Introduces students to the medical dimension of thermonuclear weapons and war. Topics center about the medical consequences of nuclear weaponry and war. Background material includes brief surveys of the physics of weaponry, modern weapon delivery systems, and biological and ecological effects of radiation. Consequence of use of tactical weapons, limited nuclear war, and full-scale nuclear exchange are considered. The medical needs, available facilities, and medical and psychosocial problems of survivors are discussed.

ID 217cd. Capitalism, Socialism, and Public Health

Not given 1986–87.

Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Lewontin, Dr. Levins, Visiting Lecturers.

Contrasts the analysis of problems in public health, nutrition, and population by Marxist and capitalistic social and economic theories. Topics include Marxist economics and social theory, population control, "green revolution," nutrition planning, maternal and child health, and occupational health.

ID 220cd. Program Design and Management for Development (KSG S-562)

Seminar. *Two 1½-hour sessions each week. 5 units.* Dr. Thomas.

Draws heavily on students' own experience and working knowledge of analytical techniques. Attempts to synthesize practical and educational experience to provide the student with a stronger set of skills for future participation in development programs. Emphasizes both the analysis of issues from a political economy perspective and the practical skills of group work, negotiation, memo writing, and verbal presentation in simulated practical situations. Students are expected to have prior experience in and career commitment to the field of development.

Enrollment subject to approval of the instructor.

ID 221d. Case Studies in Decision Making in the Control of Diseases of Public Health Importance

Not given 1986–87.

Lectures, team meetings. *Two 2-hour sessions each week. 2.5 units.* Dr. Nichols, Guest Lecturers.

Cases drawn from domestic and Third World sources are studied from the standpoint of decision makers in the control of diseases of public health importance. Students in teams will propose solutions to problems after utilizing information drawn from a spectrum of sources, including: molecular biology, host-parasite interactions, epidemiology, management of resource allocations, cultural and socio-economical constraints.

Enrollment limited to 50 and subject to approval of the instructor. No auditors.

ID 222d. The AIDS Epidemic: Status, Dynamics, Prospects, Conflicts

Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Essex, Dr. Mueller.

Deals with a broad range of topics relating to the public health implications of the AIDS epidemic, including the virology, therapy, and etiologic hypotheses concerning the origins of the virus. Topics for discussion and review include the dynamics of the epidemic, public policy issues relevant to measures to reduce the spread of infection, economic implications, and social support needs of affected persons.

Prereq. MD degree or demonstrated knowledge of virology, molecular biology, or animal biology, or permission of the instructor.

ID 225d. A Case Study in Urban and Industrial Health Planning in a Developing Country

Not given 1986–87.

Lectures, small seminars, workshops. *Two 2-hour sessions each week. 4 units.* Dr. Nichols.

Curative and preventive medicine requirements for a large industrial project and surrounding city are studied, together with essential public health support services. Planning includes: definition of the problem; description of health hazards and load on the health services; alternate solutions; enabling and functional linkages required; functional programming, including proximity matrices, facilities, staffing, operational support, management and administration requirements, costing, and implementation.

Enrollment limited to 40 and subject to approval of the instructor. No auditors. Ordinal grades only.

ID 230b. Health of Community Populations

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Gortmaker, Members of the Faculty, Guest Lecturers.

Principally targeted for those with interests in biostatistics, epidemiology, health policy, and management. Focuses on the common diseases particularly affecting persons living in poverty or near poverty conditions in urban America. Discusses the impact of socio-economic, cultural, and environmental factors upon ill health. Provides an overview of the types of data available from which to identify community health problems. Presents and evaluates case studies from local communities. Prereq. HPM 104a or equivalent.

ID 232cd. Change Strategies at the Community Level

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. J. L. Brown.

Assists students in analyzing and understanding functional aspects of communities, and in understanding the role of various institutions with respect to health, illness, and the quality of life in communities. Analyzes variables which contribute to success or failure in altering health conditions, and the roles which health professionals play in altering the health status of populations.

Prereq. Present or past clinical/field experience.

ID 330f. Field Trip

Three-day period between c and d terms. 1 unit. Dr. Nichols.

Centers for Disease Control, Atlanta, Georgia.

The Centers for Disease Control (CDC) is a unique institution with many public health functions relevant to the educational and research interests of domestic and foreign students. This field trip will give students an overview of the activities of the CDC, as well as an opportunity to meet individually with professional staff at CDC. Lectures and tutorials are provided related to the various disciplines at CDC, including occupational diseases, surveillance systems, epidemiology, control measures for both chronic and infectious diseases, and CDC's role in international health. Other topics will be arranged depending on the interests of the group. A resume of the material covered is required of each student.



Dr. Steven L. Gortmaker, Associate Professor of Sociology and Acting Chairman of the Department of Behavioral Sciences, chairs the school's Health Promotion Task Force.

■ BEHAVIORAL SCIENCES

BEH 201a. An Introduction to the Role of Behavioral Sciences in Public Health

Not given 1986–87.

Lectures. *One 1½-hour session each week. 1.25 units.* Dr. Wechsler, Dr. Gortmaker, Guest Lecturers.

Covers major areas of concern to the behavioral scientist. Topics will include the role of the media in health and illness promotion, inequality in health care and health status, cultural factors in seeking health care, the impaired physician, and the doctor/patient relationship.

BEH 202b. Health and Behavior

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.

Reviews socio-demographic and socio-psychological factors in the initiation, maintenance, and cessation of health-related behaviors. Considers behavior change strategies for primary and secondary prevention of disease from a health policy perspective and focusing on issues of compliance with medical regimens. Primary instructor is Dr. Daltroy.

BEH 205cd. Behavioral Sciences in International Perspective

Seminars, lectures. *One 2-hour session each week. 2.5 units.* Dr. Pierce.

Offers a survey of various behavioral sciences theories and practices. The aim is to demonstrate how such information can be modified for application to problems which are common to health problems in human society, regardless of locality. Readings, seminars, lectures, discussions, and written assignments will cover three broad areas: health, communication, and cooperation.

BPH 210c. Mass Communications and Public Health

Seminars, case studies, lectures. *Eight 1-hour sessions each week, two full-day trips. 2.5 units.* Dr. Gortmaker, Dr. Schwartz.

Covers the theory of communication, creation of radio and TV advertising, research and polling, media buying, contextual uses of media, media and political strategy, public relations, and lobbying. Students spend two weekends in a New York studio producing health-promotion commercials. Lectures in Boston are via teleconference with the studio in New York.

BEH 210c. Mass Communications and Public Health

Seminars, case studies, lectures. *Eight 1-hour sessions each week, two full-day trips. 2.5 units.* Dr. Gortmaker, Dr. Schwartz.

Covers the theory of communication, creation of radio and TV advertising, research and polling, media buying, contextual uses of media, media and political strategy, public relations, and lobbying. Students spend two weekends in a New York studio producing health-promotion commercials. Lectures in Boston are via teleconference with the studio in New York.

BEH 215c. Inducing Social Change

Lectures. *Two 1½-hour sessions each week. 2.5 units.* Dr. Mertens.

Designed for various specialists in public health who are charged with responsibility for introducing changes in organizations and communities. The subject matter includes methods and theories of teaching, principles of individual and group psychotherapy, approaches to sensitivity training and group dynamics, and organizational theory. Techniques and procedures illustrating these theories are presented through readings, discussions, and case illustrations.

BEH 216cd. Case Studies in Health Promotion

Case studies. *One 2-hour session each week. 2.5 units.* Members of the Department.

Examines health promotion/education interventions in the US and developing nations. Teaches techniques of intervention design using print and non-print media. Applies basic principles of education and social psychology.

BEH 220cd. The Epidemiology of Pathological Behaviors: Problems, Concepts and Methods

Seminars. *One 3-hour session each week. 5 units.* Dr. Wechsler.

Surveys the epidemiology of pathological behaviors and social pathologies. Topics include psychiatric disorders, alcoholism and drug addiction, suicide, antisocial behavior, smoking, and anorexia. Provides an historical overview of studies using data from treatment services and institutions as well as field studies of the general population.

BEH 221c. Mental Health Factors in Organizations and Industry

Lectures, readings, case illustrations. *One 2-hour session each week. 2.5 units.* Dr. Mertens.

Covers psychological well-being of entire organizations, interpersonal conflict, psychological causes of industrial accidents, industrial and organizational stress, and the organization of psychological units in industry.

BEH 222c. Alcoholism and Alcohol Abuse

Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Wechsler.

Covers the diagnosis, prevalence, and etiology of alcoholism and alcohol abuse. Topics include sex and cultural differences, high-risk groups, effects on health, accidental injuries, treatment, prevention, and public policy.

BEH 223d. Drug Addiction and Drug Abuse

Seminars, discussions. *Two 1½-hour sessions each week. 2.5 units.* Members of the Department.

Covers the prevalence of drug addiction and abuse. Topics include epidemiology,

effects on health, etiology, prevention and treatment, and public policy.

Primary course instructor is Dr. McAuliffe.

BEH 230cd. Social and Behavioral Research Methods

Seminars. *Two ½-hour sessions each week. 5 units.* Dr. Gortmaker.

Covers aspects of behavioral research methods, including research design, measurement, sampling, data collection, and data analysis. By case studies, methodological readings, and discussion, students learn the conduct and critical evaluation of experiments, surveys, index construction, longitudinal research, and observational studies.

Prereq. BIO 200ab or BIO 201ab.

HPM-BEH 245c. Setting and Implementing Priorities in Public Health: The Case for Health Promotion

Lectures, discussions. *One 3-hour session each week. 2.5 units.* Members of the Department, Guest Lecturers.

(Course described under Health Policy and Management.)

BEH 300abcde. Tutorial Programs

Time and credit to be arranged.

Members of the Department.

Arrangements may be made with individual instructors to give a reading course on topics not covered in the department's course offerings.

BEH 350. Research Training

Training in research is available through individual arrangements with the members of the department.

The following courses, offered in the Harvard Graduate School of Education, are among those that may be of particular interest to students of the behavioral sciences. They are open to qualified students from the School of Public Health.

Human Development, Counseling and Consulting Psychology C-230.

Community Psychology

Fall term. Katz.

Human Development, Counseling and Consulting Psychology C-240.

Psychological Healing in Cross-Cultural Perspective

Spring term. Katz.

■ BIOSTATISTICS

BIO 111cd. Biostatistics for Medical Investigators

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Gelman.

Topics include role of randomization, replication, and local control; planning of scientific experiments, therapeutic investigations, and prognostic factors; concept of a population, mean, and variance; confidence procedures for one and two population problems; analysis of proportions; survival data, life tables, and maximum likelihood estimates.

BIO 112a. Computing Principles and Methods I

Lectures, discussions. *Two 1½-hour sessions each week. 2.5 units.* Dr. Pagano.

Introductory course designed to provide basic computer literacy to students from all disciplines. Topics include computer terminology; the organization, capabilities, and limitations of modern computer systems; data collection methods and programming principles. Emphasizes use of personal computers. Introduces word processing and spread sheet software.

BIO 113b. Computing Principles and Methods II

Lectures, discussions. *Two 1-hour sessions each week.*

Laboratory. *One 1½-hour session each week. 2.5 units.* Members of the Department.

A practical introduction to the principles of programming using a high-level programming language.

Primary course instructor is Ms. McFadden. Prereq. BIO 112a or equivalent.

BIO 200ab. Introduction to Statistical Methods

Lectures, discussions. *Two 1½-hour sessions each week.*

Laboratory. *One 1-hour session each week. 5 units.* Dr. Harrington.

Covers basic statistical techniques which are important for analyzing data arising from clinical and laboratory studies. Major topics include elements of probability, introduction to estimation and inference, distribution free methods, contingency tables, life tables, regression analysis, and elements of study design. Applications are stressed. Designed as an alternate to BIO 201ab, for students desiring more emphasis on theoretical developments or those having had an introductory statistics course at the level of BIO 201ab. Credit will not be given for both BIO 200ab and BIO 201ab. Prereq. A course in calculus.

BIO 201ab. Principles of Biostatistics

Lectures. *Two 1-hour sessions each week.*

Laboratory. *One 2-hour session each week. 5 units.* Dr. Drolette.

Lectures and laboratory exercises acquaint the student with the basic concepts of biostatistics and their application and interpretation. Topics include descriptive

statistics, probability distributions, inference, tests of significance, association, and regression.

Note: This course cannot be counted as part of the credit requirement for a major or minor doctoral field. Credit will not be given for both BIO 200ab and BIO 201ab.

BIO 202cd. The Analysis of Rates and Proportions

(Formerly *Statistical Methods for Epidemiological Research*)

Lectures. *Two 1½-hour sessions each week.*

Laboratory (optional). *One 2-hour session each week. 5 units.* Dr. Tsatis.

Emphasizes concepts and methods for quantifying relationships between variables. Stresses issues in nonexperimental research. Topics include measures of association, confounding and interaction, analysis of two-by-two contingency tables, logistic regression, analysis of matched pairs, analysis of rates, and survival data analysis.

Prereq. BIO 200ab, BIO 201ab, or equivalent.

BIO 203cd. Regression and Analysis of Variance in Experimental Research

(Formerly *Statistical Methods in Experimental Research*)

Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Knuiman.

Covers analysis of variance and regression, including details of data-analytic technique and implications for experimental design. Also included are probability models and some computing. Students learn to formulate a scientific question in terms of a statistical model, leading to objective and quantitative answers.

Prereq. BIO 200ab, BIO 201ab, or equivalent.

BIO 204cd. Vital and Health Statistics

Lectures and discussions. *One 2-hour session each week. 2.5 units.* Dr. Larson.

Discusses the types, sources, methods of data collection, and uses of vital and health statistics for public health purposes. Emphasizes effective use of existing data, together with consideration of incomplete data and sampling methods for obtaining new information, both nationally and internationally.

BIO 205cd. Mathematical Foundations of Biostatistics

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Drolette.

Material includes mathematical descriptions of commonly used distributions; standard procedures for estimating the moments of a distribution; and mathematical foundations of statistical inference, including the Neyman-Pearson lemma, the likelihood ratio, the central limit theorem, power and Bayesian inference.

Prereq. A course in elementary calculus.

BIO 207cd. Survey Research Methods in Community Health

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Members of the Department.

Covers research design, sample selection, questionnaire construction, interviewing techniques, the reduction and interpretation of data, and related facets of population survey investigations. Focuses primarily on the application of survey methods to problems of health program planning and evaluation. Treatment of methodology is sufficiently broad to be suitable for students who are concerned with epidemiological, nutritional, or other types of survey research.

Primary course instructor is Dr. Manigione.

Topics in Biostatistics (BIO 209ab and BIO 210cd)

Offered primarily for students majoring in biostatistics or epidemiology, although qualified students from other departments are welcome. The topics covered will vary from year to year, based on recent developments in biostatistics and the research interests of the instructor. Registration requires the permission of the instructor.

BIO 209ab. Empirical Bayes Methods

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Louis, Dr. Laird.

Introduces students to a broad category of statistical methods included in the category "empirical Bayes methods." Topics include Bayesian inference, empirical Bayes, two-stage sampling, James-Stein estimation, pooling, smoothing, shrinking, and the EM algorithm. Applications in public health, medicine, and risk assessment are discussed. A student project is required.

Prereq. BIO 217ab and BIO 218cd or equivalent.

BIO 210cd. Weighted Distributions and Encountered Data

Lectures. *One 2-hour session each week. 2.5 units.* Members of the Department.

Discusses weighted distributions in data gathering, modeling, inferences, and computing. Major topics include mathematical and statistical concepts and methods for the modeling of weight functions representing selection bias and encountering, robustness and sensitivity to weight functions, validation of weight functions, confounding of parameters and their identifiability, characterization problem and structural studies, estimation problems, representativeness issues, and computer generation. Covers applications to clinical investigations and length biased sampling, ascertainment studies for rare genetic traits, resource utilization and management surveys, transect sampling in statistical ecology and biometrics, and several other areas of current interest. Prereq. BIO 218cd or equivalent.

Primary course instructor is Dr. Patil.

BIO 211cd. Discrete Multivariate Analysis

Lectures. *Two 1½-hour sessions each week.*

Laboratory. *One 1-hour session each week. 5 units.* Dr. Ware.

Deals with the use of log linear and logistic models for analyzing counted data. Emphasizes practical application rather than mathematical theory. Extensive use is made of computer packages for data analysis. Topics include the analysis of contingency tables, chi-square and exact tests, measures of association, logistic regression, log linear analysis using iterative proportional fitting, and the binomial, multinomial, and Poisson distributions.

Prereq. One or more of the following courses: BIO 200ab, BIO 202cd, BIO 203cd, or equivalent.

BIO 214c. Principles of Clinical Trials

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Gelber.

Designed for individuals interested in the scientific, policy, and management aspects of clinical trials. Topics include types of clinical research, study design, treatment allocation, randomization and stratification, data management and quality control, sample size requirements, patient consent, and interpretation of results. Students will design a clinical investigation in their own field of interest and will critique recently published investigations.

Prereq. Previous or concurrent enrollment in an introductory statistics course.

Required for students in the two-year Health Policy and Management Program Medical/Dental Track.

BIO 217ab. Probability Theory and Applications

Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Zelen.

A course in probability theory fundamental to the statistics program. Topics include algebra of events, axiomatic foundations, combinatorial probability, discrete and continuous sample spaces, Lebesgue integration, conditional probability and independence, random variables, generating functions and characteristic functions, standard distributions, expectation and variance operators, limit theorems, Poisson processes, and applications in health-related areas.

Prereq. Intermediate calculus (one or two semesters beyond elementary calculus).

BIO 218cd. Statistical Inference

Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Ryan.

A fundamental course in statistical inference. Topics include methods of estimation, least squares, maximum likelihood, Bayesian methods, properties of estimates, confidence procedures, significance testing, likelihood ratio tests, goodness of fit tests, Neyman-Pearson theory, sufficiency, power and optimality, sequential analysis, nonparametric infer-

ence, and decision theory. The theory will be illustrated with examples from health-related research.

Prereq. BIO 217ab or equivalent.

HPM-BIO 219b, 219c, 219d. Statistical Methods for Health Policy and Management

Lectures. *Three 2-hour sessions each week. 2.5 units each period.* Dr. Anderson, Dr. Mehta.

(Course described under Health Policy and Management.)

BIO 220cd. Multivariate Analysis for Quantitative Data

Not given 1986–87; offered alternate years.

Lectures, student presentations. *Two 1½-hour sessions each week. 5 units.* Dr. Ware.

An introduction to the fundamentals of multivariate analysis and the analysis of serial measurements. Topics include the multivariate normal distribution, estimation of the mean and covariance matrix, Hotellings T^2 , principal components, factor analysis, random effects and mixed models, and variance components. Reviews classical methods for the analysis of repeated measures and longitudinal data and presents newer methodology based on random effects and time series formulations. Discusses computational issues for both traditional and new methodologies.

Prereq. At least one statistics course beyond the level of BIO 202cd. Knowledge of matrix algebra and some familiarity with computer packages such as SPSS, BMD, or SAS.

BIO 235cd. Mathematical Models in Biology

Not given 1986–87; offered alternate years.

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Feldman, Dr. Awerbuch.

Mathematical models as a basis for analyzing biological phenomena. An intermediate level course for students in laboratory science and biostatistics. Applied topics include carcinogenesis, compartmental distribution of drugs and toxic substances, molecular binding, diffusion bioassay, membrane transport, cell and enzyme kinetics, and physiologic scaling. Methodological topics include curve-fitting, experimental design, and computer simulation.

Prereq. Introductory calculus; BIO 202cd or BIO 203cd (may be concurrent).

BIO 240cd. Design of Scientific Investigations

To be given 1986–87; offered alternate years.

Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Laird.

Discusses those aspects of statistical theory and practice relative to the design of scientific investigations in the health sciences. Topics include planning of sample surveys; basic principles of experimental design: randomization, replication, and

balance; randomization related to distribution-free methods; fixed, mixed, and random models; experimental designs and techniques for reducing variability; block designs and analysis of covariance; human studies; multicenter longitudinal follow-up and observational studies; sequential studies; adaptive and allocation rules; special features with discrete response data.

Prereq. BIO 263ab (may be concurrent) or permission of the instructor.

BIO 251ab. Data Analysis

To be given 1986–87; offered alternate years.

Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Louis.

Surveys methods of exploratory data analysis, modern non-parametrics, sample reuse, and empirical Bayes. Topics include review of linear regression analysis, robust and resistant fitting techniques, regression diagnostics, non-parametric regression, and cross-validation. Jack-knife and bootstrap sample reuse plans are introduced. Underlying concepts, interpretations, and practical experience are stressed. Prereq. A course beyond BIO 201ab or equivalent.

BIO 261ab. Theory of Biometry I

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Lagakos.

Discusses the theoretical basis of concepts and methodologies associated with survival data and censoring, nonparametric tests, competing risk models, carcinogenicity testing, and low dose extrapolation. Material is drawn from recent literature.

Prereq. BIO 211cd and BIO 218cd or permission of the instructor.

BIO 262cd. Theory of Biometry II

To be given 1986–87; offered alternate years.

Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Lagakos, Dr. Tsatis, Dr. Zelen.

This course is divided into three distinct units: stochastic processes and biomedical phenomena, theory of logistic and polychotomous regression, and the use of GLIM for model building. Topics to be discussed are point processes, recurrent events, and screening for early detection of disease; conditional logistic regression and its generalizations, models for binary time series, tests on Markoff chains, and extensions to urn models; theory and practice of generalized linear models, use of quasi-likelihood, and issues of extra-variation.

Prereq. BIO 211cd, BIO 218cd, or BIO 261ab, or permission of the instructor.

BIO 263ab. Regression and Analysis of Variance

Lectures. *Two 1½-hour sessions each week plus one 2-hour lab session each week. 5 units.* Dr. Schoenfeld, Dr. Finkelstein.

Describes general procedures of estimation and hypothesis testing for linear models: least squares and maximum like-

likelihood estimation, Cochran's theorem, Gauss-Markov theorem, estimable functions, multivariate normal distribution, and simultaneous inference. Discusses techniques of analysis of variance and experimental design: partitioning sum of squares, factorial experiments, nested design, analysis of covariance, and repeated measures. Lab sessions emphasize data analysis and use of the statistical packages SAS and BMDP.

Prereq. BIO 218cd or equivalent; familiarity with matrix algebra.

BIO 273ab. Introduction to Computing

Lectures. Two 1½-hour sessions each week.

Laboratory. One 2-hour session each week. 5 units. Dr. Orav.

An intermediate-level course in computing which expands on the systematic design of programs and algorithms in the C programming language. Emphasizes advanced C techniques and leads to more general discussion of data structures and handling. Topics include the structure of digital computers, algorithm development and usage, the systematic design of programs, advanced C programming techniques, and an introduction to data structures.

Prereq. Programming experience in a high-level language.

BIO 274cd. Statistical Computing

To be given 1986–87; offered alternate years.

Lectures. Two 1½-hour sessions each week.

Laboratory. One 1½-hour session each week. 5 units. Dr. Pagano.

Enables students to understand, properly use, and possibly develop statistical algorithms or software. Topics are prompted by statistical procedures or biomedical applications and include computer arithmetic, error analysis, numerical techniques, equation solving, matrix operations, approximation and smoothing, optimization, and simulation modeling. Prereq. BIO 273ab or equivalent or permission of the instructor.

BIO 275cd. Applied Data Management

Not given 1986–87; offered alternate years. Lectures, demonstrations. Two 1½-hour sessions each week.

Laboratory. One 1½-hour session each week. 5 units. Members of the Department.

Introduces management of data, both external and internal to computer data bases, concepts and techniques for handling data before it is ready for analysis, and practical aspects of computer data base design and usage. Topics include data collection, forms and coding, data entry systems, quality control, data base structures (both logical and physical), data base management systems, file organization, and data models.

Prereq. BIO 273ab or equivalent or permission of the instructor.



BIO 276ab. Principles of Systems

Not given 1986–87; offered alternate years.

Lectures. Two 1½-hour sessions each week. 5 units. Members of the Department.

Topics to be covered include process management (asynchronous concurrent processes, semaphores, inter-task communications, monitors/resource managers, and resource deadlock), real and virtual storage management, processor management (scheduling), multiprocessing (loosely vs. tightly coupled machines), auxiliary storage management (disk scheduling, file and database systems), performance measurement and evaluation, analytic modeling (Markov process and queuing theory), networks and network security, and operating system security. The final portion of the course involves case studies of several major operating systems.

Prereq. BIO 273ab or equivalent.

BIO 277cd. Computing Applications in the Biomedical Sciences

Not given 1986–87; offered alternate years.

Lectures. Two 1½-hour sessions each week. 5 units. Dr. Pagano.

Intermediate-level course designed to provide a technical overview of the application of computers to the biomedical sciences. Topics include computerized medical record systems, diagnostic and therapy support systems, patient monitoring, clinical laboratory systems, occupational health systems, and medical imaging.

Prereq. BIO 113b or BIO 273ab or equivalent.

HPM-BIO 280c. Decision Analysis for Health and Medical Practices (KSG S-176m)

Lectures, discussions. Two 2-hour sessions each week. 2.5 units. Dr. Begg.
(Course described under Health Policy and Management.)

HPM-BIO 281d. Seminar on Clinical Decision Analysis

Seminar. Two 2-hour sessions each week. 2.5 units. Dr. Politser, Dr. Fineberg.

(Course described under Health Policy and Management.)

HPM-BIO 283b. Behavioral Decision Theory in Health

Lectures, discussions. Two 2-hour sessions each week. 2.5 units. Dr. Politser.

(Course described under Health Policy and Management.)

BIO-HPM 284a. Topics in Decision Theory

Lectures, seminars. One 3-hour session each week. 2.5 units. Dr. Politser.

Presents selected topics in the theory and methods that underlie decision and risk analysis, including axiomatic foundations of expected utility theory, statistical decision theory, ROC analysis and diagnostic technology assessment, multiattribute utility theory, criticisms, alternatives, and research frontiers.

Prereq. HPM 280c, HPM 279c, or equivalent; at least one semester of biostatistics beyond the introductory level; knowledge of elementary calculus and matrix algebra. Permission of the instructor required.

BIO-HPM 285ab. Health Risk Assessment and Appraisal

Lectures. One 2-hour session each week. 2.5 units. Dr. Bailar, Dr. Graham.

Identifies hazards to health, dose-response relationships, exposure assessment, and their integration to an overall quantitative risk assessment. Special attention to hazards from toxic chemicals that are ill-defined or hard to measure, heterogeneity in sensitivity, conflicting data, and non-random errors. Focus throughout is on risk assessment for use in regulatory decision making. Prereq. BIO 200ab, BIO 201ab, or equivalent.

BIO 310-315abcd. Tutorial Programs

Time and credit to be arranged. Members of the Department.

An opportunity for tutorial work is offered for interested and qualified students or small groups of students. Arrangements must be made with individual faculty members and are limited by the amount of faculty time available. These programs are open to students specializing in biostatistics and also to students in other fields who wish to go beyond the content of the regular courses. Six broad categories of this tutorial instruction are identified by the six course numbers below.

310 Statistical Methods

Guided study in specific areas of statistical methodology and applications.

311 Teaching

Work with members of the department in laboratory instruction and the development of teaching materials.

312 Consultation

Work with members of the department on current statistical consultation activities.

313 Computing

Guided study in scientific programming, numerical methods, and data management.

314 Study Design

Guidance in developing statistical design of a study in which the student has a particular interest.

315 Data Analysis

Guidance in the statistical analysis of a body of data in which the student is interested.

Students may register for BIO 310-315 for a maximum of 5 credit units in the summer term.

BIO 350. Research

Candidates for the Doctor of Public Health or Doctor of Science degree may arrange for individual research. The work may be part of the program for a doctorate in this department or may be integrated with doctoral research in other departments.

■ CANCER BIOLOGY**CB 202b. Critiques of Current Literature in Virology and Immunology**

Seminars. *One 2-hour session each week. 1 unit.* Members of the Department.

Papers on topics of general interest are selected from current periodicals and critically reviewed as to soundness of experimental design, validity and significance of results and conclusions, organization of manuscript, and clarity of presentation. The course will not be given if less than eight students enroll.

CB 204ab. Immunobiology

Lectures. *One 1½-hour session each week. 2.5 units.* Dr. Glimcher, Faculty and Guest Lecturers.

Examines the anatomy and physiology of the immune system, fate of antigen, cell trafficking, cellular interactions, and regulation of the immune response, and B and T cell recognition mechanisms. Principles of immunoregulation will be discussed in the context of current literature. Grade will be based on class participation and a paper. Students must have basic courses in microbiology and immunology and approval of the instructor.

CB 205ab/205cd. Departmental Seminar

Seminars. *One 1-hour session each week. 1.25 units each term.* Dr. Eisenstadt, Dr. Mullins, Members of the Department.

Students and faculty will present research seminars and current literature reviews. Topics include chemical and viral carcinogenesis, DNA damage and repair, immunology, molecular biology, radiobiology, and virology.

Enrollment required for all doctoral students in Cancer Biology.

CB 207cd. Radiation Biology

Not given 1986–87; offered alternate years. Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Little.

This course is divided into two parts: cellular and human radiobiology. The first includes radiation chemistry, cell survival, transformation and mutagenesis, cytogenic effects, UV-photobiology, and cellular and molecular repair processes. The second covers effects of radiation in man and characteristics of internal and external human exposure. The biologic basis of the acute radiation syndrome and the human epidemiologic data for radiation carcinogenesis are emphasized.

Prereq. ESP 205ab or college-level course in biology.

CB 212ab. Introduction to Cancer Biology

Not given 1986–87; offered alternate years. Lectures and discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Kennedy, Dr. Eisenstadt, Dr. Cairns, Guest Lecturers.

Emphasizes current experimental approaches to studying cancer biology and the process of carcinogenesis. Topics include the biology of cell modification and

differentiation, the phenotype of the cancer cell, the properties of human and animal cancers, the process of cell transformation, mutagenesis, carcinogen metabolism and the general features of cancer epidemiology, and what these say about the causes of human cancer. Early in the course, several introductory lectures will be given to cover basic concepts of genetics, cell biology, and molecular biology.

A background in some branch of science is desirable.

CB 217ab. Human and Animal Virology

Not given 1986–87; offered alternate years. Lectures. *Two 1½-hour sessions each week. 5 units.* Dr. Essex, Dr. Mullins.

Provides students with fundamentals of medical virology and introduces the new and relevant concepts emanating from recent and ongoing research. Topics include virus-host cell interaction, molecular aspects of virus replication and pathogenesis, pathogenesis, chronic and latent infections, epidemiology, environmental factors, host defense mechanisms, molecular and virological techniques, and community control measures. Selected virus groups discussed in detail. Suggest students discuss enrollment with instructor before registering. The course will not be given if less than eight students enroll.

CB 219cd. Advanced Cancer Cell Biology (Biophysics 203)

Lectures. *One 2-hour session each week. 5 units.* Dr. Haseltine, Dr. Chen (Associate Professor of Pathology, Harvard Medical School).

This is an advanced-level course for those planning to do research in the areas of carcinogenesis, tumor cell biology, and cancer pharmacology. Examines the nature of cancer at the molecular level. Explores the differences between normal cells and tumor cells in animals and in tissue culture. Draws upon cell biology, viral oncology, tumor immunology, and genetics. Specific topics include viral and chemical carcinogenesis, genetics of cancer and the transformed state, the nature of virus coded transformation functions, exogenous control of cell growth, the cell surface of normal and transformed cells, cell structure and mobility, the differences between benign and malignant tumors, the problem of metastasis, and mutation and differentiation as models for cancer.

Suggested prereq. Cell Biology 202, *The Biology of the Cancer Cell*, Biochemistry 165, *Oncogenic Viruses*, CB 217b or equivalent.

CB 300abcd. Tutorial Programs

Time and credit to be arranged. Members of the Department.

Enrollment requires the consent of the staff member responsible for supervision of the research. The various subject areas are listed below by category.

302 Viruses

Dr. Essex, Dr. Haseltine, Dr. Mullins. Isolation and identification of repre-

sentative viruses by use of cell culture, animal inoculation, and serologic and molecular biological techniques.

303 Immunochemical Methods

Dr. Essex, Members of the Department.

Methodology of immunofluorescence, enzyme-linked immunoassays, ⁵¹Cr-release, chromatography, immunoelectrophoresis, monoclonal antibodies as applied to oncogenesis, and resistance to infectious viral agents.

304 Public Health Laboratory

Associates at the State Laboratory Institute.

The State Laboratory Institute is engaged in a variety of programs related to public health. These include the development, preparation, and testing of new and standard serums, vaccines and blood fractions; research in various aspects of applied immunology; various aspects of diagnostic service in the fields of bacteriology, virology, and congenital metabolic disorders; and field studies on arboviruses. Individual arrangements for study can be made in any of these programs.

305 Tumor Biology

Members of the Department.

Approaches and techniques for the study of cancer as an infectious disease. Procedures used to study tumor cell and tumor virus marker antigens and antibodies demonstrated. The significance of these markers for epidemiological, etiological, and diagnostic investigations of various tumor systems of known and unknown causes discussed. The relationship between the immune response and the oncogenic process examined.

306 Cellular Immunology and Molecular Biology of the Immune System
Dr. Glimcher.

Examines the events following immunization of infection where the quality and quantity of the immune response is regulated by subsets or lymphocytes and their products. The mechanism of this regulation is explored by analyzing immunologic circuits, idiotype recognition, and antibody and cell mediated cytotoxicity.

307 Radiobiology

Dr. Little, Dr. Kennedy.

Current topics in radiobiology at molecular, cellular, and organismal levels. Cytotoxic, mutagenic, and carcinogenic consequences of ionizing and nonionizing radiations are examined, with emphasis on genetic, physiologic, and environmental factors that modify these biologic effects.

308 Chemical Carcinogenesis

Dr. Cairns, Dr. Eisenstadt, Dr. Haseltine.

Methodology and interpretation of tests for chemical carcinogens, mutagenesis and repair of DNA, and the time course of the formation of cancer.

CB 350. Research

Qualified doctoral candidates, research fellows, and full-time special students may register for CB 350 to undertake original research in virology, bacteriology, immunology, or in one of the disciplines available at the State Laboratory Institute. A number of the current research activities of the department are indicated under CB 300. Inquiries about specific research opportunities should be addressed to the chairman of the department.

■ ENVIRONMENTAL SCIENCE AND PHYSIOLOGY

ESP 201a, ESP 201c. Principles of Environmental Health I

Lectures. Two 2-hour sessions each week. 2.5 units. Dr. Moeller.

Represents a first step in a review of the more important environmental health problems facing society. Topics include environmental physiology, radiation protection, community air pollution, occupational health, and municipal water purification and wastewater treatment. Students will be required to develop and submit plans for a term paper.

Note: Students in the MPH program are required to take this course, plus either ESP 202b or ESP 203d. For convenience in scheduling, ESP 201 is offered in both the "a" and "c" periods.

ESP 202b. Principles of Environmental Health II

Lectures. Two 2-hour sessions each week. 2.5 units. Dr. Moeller.

Represents a continuation in the review of the more important environmental health problems facing society. Topics include energy and the environment, environmental toxicology and hazardous waste management, environmental law and economics, accidents and public health, insect and rodent control, and environmental monitoring. Submission of a completed term paper is required.

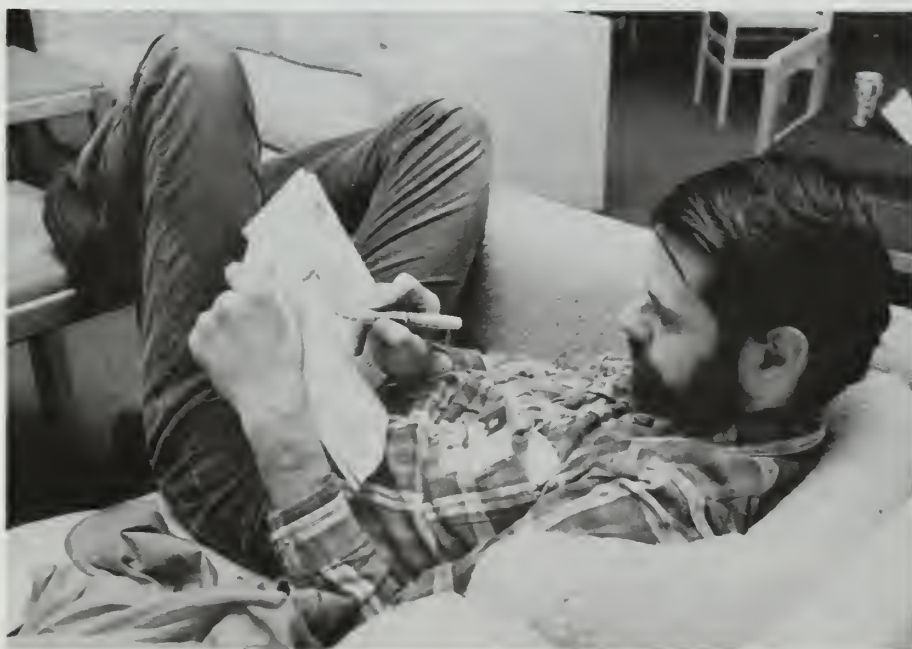
Note: Students in the MPH program are required to take either this course or ESP 203d, plus ESP 201. Enrollment in ESP 202b is recommended for students specializing in one or more of the programs of the Department of Environmental Science and Physiology.

ESP 203d. Principles of Environmental Health III

Lectures. Two 2-hour sessions each week. 2.5 units. Dr. Moeller.

Emphasizes environmental health problems in the less-developed countries. Topics include individual household water supplies and wastewater treatment; basic sanitation; insect and rodent control; nutrition and foodborne diseases; housing and home accidents; operation, maintenance, and management of environmental systems; environmental manpower and training; and the selection of appropriate technology for coping with such problems. Submission of a completed term paper is required.

Note: Students in the MPH program are required to take either this course or ESP 202b, plus ESP 201. Because of the special orientation of the subject matter presented, it is suggested that students interested in environmental health problems in the less-developed countries enroll in ESP 203d. Students interested in the subject matter in this course, as well as that presented in ESP 202b, may take both courses, as well as ESP 201, and receive credit for all three courses (7.5 units).



ESP 204cd. Environmental Health Evaluation and Management

Not given 1986-87.

Seminars, lectures. *Two 1½-hour sessions each week; additional computational sessions to be arranged.* 5 units. Dr. Harrington.

Introduces concepts and analytical methods for the quantitative evaluation and management of man's environment. Topics include the development of natural resources, resulting environmental conditions, and effects on human health. Where appropriate, mathematical models are developed and critiqued in a systems-analysis framework. Students are required to submit a term project.

A strong background in college-level mathematics is assumed.

ESP 205ab. Human Physiology

Lectures, conferences, demonstrations. *Two 1-hour and one 2-hour sessions each week.* 5 units. Dr. Loring, Dr. Banzett, Members of the Department.

Students lacking a background in biology are offered an intensive introduction to biological principles and to the physiology of cells, organ systems, and organisms. Some pathophysiology and a number of laboratory exercises are included.

Students without college courses in physics, chemistry, and mathematics should speak with the instructor beforehand.

EPI-ESP 215cd. Case Studies in Environmental and Occupational Epidemiology

Lectures, Seminars. *One 2-hour session each week.* 2.5 units. Dr. Monson, Dr. Robins.

(Course described under Epidemiology.)

ESP 221cd. Pulmonary Cell Biology

Not given 1986-87; offered alternate years. Lectures. *One 2-hour session each week.* Laboratory/review sessions. *To be arranged.* 5 units. Dr. Valberg, Members of the Department, Guest Lecturers.

Provides an overview of cell biology as it relates to the structure and function of the cell types found in the respiratory system. Specialization in the plasma membrane, cytoplasmic filaments, macromolecules, secretory products, and organelles will be related to the tasks the cells perform. Particular consideration will be given to how cell and tissue functions are integrated to provide for both efficient gas exchange and for defense against inhaled particles and pathogens. The relationship of cell biology to current research on inhalation toxicology and pulmonary disease will be explored, and students will become familiar with the techniques of molecular biology. Prereq. College-level course in one or more of the following topics, otherwise permission of the instructor: physiology, histology, cell biology, or biochemistry.

ESP 222cd. Structure and Function of the Mammalian Respiratory System

To be given 1986-87; offered alternate years.

Lectures. *One 3-hour session each week.* Demonstrations, discussions. *To be arranged.* 5 units. Dr. Leith, Dr. Brain, Dr. Mead, Dr. McMahon (Professor of Biology, Division of Applied Sciences), Dr. Taylor (Professor of Biology, Faculty of Arts and Sciences).

An introduction to the structure and morphometry of the respiratory system of mammals (from lung to mitochondria), integrating structural and morphometric information with physiological data. Requirements include lectures, demonstrations, discussions, term paper, and oral presentations.

Prereq. College-level course in histology or cell biology.

ESP 231cd. Occupational Health Policy and Administration

Seminars. *Two 2-hour sessions each week.* 5 units. Dr. Monson, Dr. Boden, Mr. Bar-mack.

Examines the legal, economic, and political foundations of occupational health activities in the United States. Discusses the roles of government, unions, corporations, and research organizations. Helps students acquire an understanding of management functions in corporations. Enables students to develop the knowledge and skills in the above areas necessary to apply medical, industrial hygiene, and statistical skills to achieve a healthful workplace.

ESP 232cd. Introduction to Occupational Medicine

Lectures. *One 2-hour session each week.* 2.5 units. Dr. Greaves, Guest Lecturers.

Reviews the diagnosis and management of occupational diseases following exposure to specific workplace substances, including asbestos, lead, organic solvents, and other substances. Methods of diagnosis of early organ system effects of chemicals and techniques for assessing disability are considered. The course is limited to physicians or others with adequate training by permission of the instructor.

ESP 233c. Industrial Toxicology

Lectures. *Two 2-hour sessions each week.* 2.5 units. Dr. Greaves, Dr. Karstadt, Dr. Letz.

Provides detailed information on organ system effects of exposure to workplace chemicals, with emphasis on understanding the pathogenesis of toxin-induced disease and on developing programs for early detection of such conditions. Pulmonary effects receive particular attention. In the second half of the course, effects of exposure to common workplace toxins (e.g., asbestos, lead, solvents, pesticides, other metals, allergens) are discussed.

Prereq. TOX 204a and ESP 251a.

No credit is given for ESP 233c until successful completion of TOX 204a.

ESP 234d. Basic Problems in Occupational Health

Lectures. *One 2-hour and one 3-hour session each week.* 2.5 units. Dr. Ferris, Dr. Greaves, Prof. Burgess, Members of the Department.

This problem-solving course uses case studies and walk-through field trips to local industries. Emphasis is on the relation of working conditions to health, with special reference to the recognition, measurement, and control of industrial hazards.

Prereq. ESP 251a.

ESP-EPI 235ab. Critical Review of the Scientific Basis for Occupational Standards

Seminars. *Two 2-hour sessions each week.* 5 units. Dr. Eisen, Dr. Robins, Dr. Monson.

Provides students with the opportunity to review the scientific basis for the association of selected occupational exposures with disease. Special emphasis is placed on critical evaluations of the literature. Reviews occupational cancer and respiratory disease, pathophysiology of respiratory disease, and epidemiologic approaches to chemical carcinogenesis. Attention is directed specifically to the interface of science and regulatory standards.

Enrollment limited to 15.

Prereq. EPI 200a or EPI 201a, BIO 200ab or BIO 201ab, ESP 234d or permission of the instructors. EPI 212d is recommended.

ESP 236cd. Advanced Methods in the Analysis of Environmental Health Data

Lectures. *One 2-hour session each week.* 2.5 units. Dr. Robins.

Focuses on the instructor's new approach to causal inference in observational studies with sustained exposure periods. Particular attention is paid to the problems that arise when risk factors determine subsequent exposure. Philosophical, statistical, computational, and subject matter issues are considered. Emphasis is on the use of this approach in the control of the healthy worker effect in occupational mortality studies. The use of this new approach in nonexperimental evaluations of the benefits of screening for cancer and of smoking cessation is also considered.

Prereq. Knowledge of epidemiology to the level of EPI 207c and EPI 208d, and familiarity with statistical models (e.g., logistic regression models).

ESP 241cd. Occupational Safety

Lectures, discussions. *One 2-hour session each week.* 2.5 units. Dr. Snook, Dr. Mangone.

Covers the principles of occupational safety. Topics include growth of the field of occupational safety; safety regulation and standards; theoretical models of accident causation; accident investigation procedures; and engineering, behavioral, and administrative techniques for accident control. Builds toward the development and validation of prescriptive systems for the alleviation of workplace hazards.

ESP 242c. Occupational Biomechanics and Work Physiology

Lectures, laboratories. *One 2-hour session each week. 1.25 units.* Dr. Snook, Dr. Ciriello.

Presents principles and occupational applications of biomechanics and exercise physiology. Topics include muscle anatomy and physiology, musculoskeletal mechanics, etiology of occupational musculoskeletal injuries and disorders, energy requirements of work, and systemic responses to work. Emphasizes the use of biomechanical and metabolic models to evaluate occupational stresses and establish safe work practices.

Enrollment limited to 30. Preference given to students in the Occupational Health Program (required for students in Industrial Hygiene/Safety).

Prereq. ESP 205ab or equivalent.

ESP 243ab. Ergonomics/Human Factors

Lectures, demonstrations. *One 2-hour session each week. 2.5 units.* Dr. Snook.

Emphasizes the design of the job to fit the worker. Specific problems are investigated which result from the nature of the job itself, e.g., low back injuries, fatigue, hand disorders, slips and falls, human error, and psychological stress. The physiological, psychological, and anatomical characteristics of the worker are considered in the development of good job design principles.

ESP 251a. Health Hazards of Manufacturing Processes

Lectures, field trips. *One 2-hour and one 3-hour session each week. 2.5 units.* Prof. Burgess, Members of the Department.

Deals with the recognition of health hazards in the workplace and the atmospheric environment, using a unit operations approach to manufacturing processes. Designed as an introduction to other courses which consider the evaluation and control of hazardous conditions in the workplace and atmospheric environment. Enrollment limited to 30 and subject to approval of the instructor. Preference given to students in the Department of Environmental Science and Physiology.

ESP 252b. Introduction to Industrial Hygiene

Lectures, seminars, laboratories. *Two 2-hour sessions each week. 2.5 units.* Prof. Burgess, Mr. DiBerardinis.

Intended for physicians, nurses, and other health professionals who will work with industrial hygienists in a variety of settings. Designed to familiarize these professionals with the methods used by the industrial hygienist in the prevention of occupational disease, thereby promoting a more effective working relationship. Topics include the physical form of air contaminants, air sampling and analysis, engineering controls, and the preparation of survey protocols.

ESP 253cd. Environmental Control (ENG SCI 270)

Lectures. *One 2-hour session each week. Laboratory. One 3-hour session each week. 5 units.* Prof. Burgess, Dr. Cudworth, Mr. Cavanaugh (Consultant in Acoustics).

Covers the design and evaluation of local and general exhaust ventilation systems for the control of toxic air contaminants; control of heat stress in industry; respiratory protection equipment; the fundamentals of sound and vibration generation, transmission, and reception; and noise control fundamentals. These topics are explored by means of lecture, laboratories, and field trips to industrial plants.

Required for concentrators in industrial hygiene and air pollution control.

ESP 254cd. Air and Gas Cleaning (ENG SCI 279)

Not given 1986–87; offered alternate years.

Lectures. *One 2-hour session each week. Laboratory. One 4-hour session each week. 5 units.* Members of the Department.

Theory, selection, application, and testing of gas-cleaning devices. Particle collection by inertial, centrifugal, electrostatic, and other forces; gas absorption in liquids, adsorption on solids, and incineration. Laboratory experiments illustrate principles involved.

Required for concentrators in air pollution control and industrial hygiene.

Prereq. ESP 261ab.

ESP 261ab. Properties of Airborne Contaminants (ENG SCI 276)

Lectures. *Two 1-hour sessions each week. Laboratories. One 2-hour session each week, "a" period; one 4-hour session each week, "b" period. 5 units.* Members of the Department.

Covers the properties of airborne contaminants (aerosols, gases, vapors) and the physical principles underlying their behavior. Topics include particle motion due to gravitational, thermal, and electrostatic forces; diffusion; particle impaction; filtration; and physical properties of gases and vapors. Laboratories cover optical and electron microscopy, sampling, measuring concentrations, and particle size measurement.

Required for concentrators in industrial hygiene and air pollution control.

Prereq. Calculus and college physics.

ESP 262cd. Assessment and Evaluation of Environmental Exposure (ENG SCI 273)

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Evans, Dr. Spengler, Dr. Ryan.

Covers principles of exposure assessment; introduces basic methods for monitoring and modeling ambient concentrations; examines relationships between concentration, exposure, and dose; discusses risk assessment and its relationship to exposure evaluation. Required for concentrators in air pollution, environmental

management, industrial hygiene, and/or radiation protection.

Prereq. Calculus and chemistry, or permission of the instructor.

ESP 263ab. Analytical Chemistry for Environmental Assessment

Lectures. *One 2-hour session each week. Laboratory. One 4-hour session each week. 5 units.* Dr. Ryan, Dr. Yanagisawa.

Introduces analytic and instrumental methods frequently used in evaluation of environmental samples, atomic absorption spectrophotometry, gas and liquid chromatography, mass spectrometry, electrochemical methods, neutron activation analysis, x-ray fluorescence, x-ray diffraction, and photochemical methods. Student projects are required.

Required for concentrators in air pollution, environmental management, and industrial hygiene.

Prereq. Permission of the instructor.

ESP-HPM 264b. Operations Management

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Evans, Dr. Shepard.

Introduces quantitative techniques useful for making models and decisions in the areas of environmental and health services. Topics include linear programming, statistical decision analysis, modeling, simulation queuing, and analysis of error propagation. Uses micro (personal) computers.

Prereq. Calculus and statistics or permission of instructor.

ESP 265cd. Air Pollution and Hazardous Waste

Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Spengler, Dr. First, Dr. Ferris.

Critically examines the federal and state laws governing hazardous waste and air pollution. Reviews health effects, damage to animals, plants, and groundwater that may occur directly or by intermedia transport. Presents control, legal, and enforcement aspects.

Prereq. (suggested); ESP 261ab, ESP 262cd, ESP 263ab.

ESP 266cd. Advanced Topics in Aerosol Science

To be given 1986–87; offered alternate years.

Lectures. *One 2-hour session each week. 2.5 units.* Members of the Department.

Covers aspects of aerosol science not covered in ESP 261ab, including coagulation, condensation and evaporation, optical properties, electrical properties, and production of test aerosols.

Prereq. ESP 261ab.

ESP 270a. Basic Radiation Protection (One half of ENG SCI 278)

Not given 1986–87; offered alternate years.

Lectures, demonstrations. *Two 2-hour sessions each week. 2.5 units.* Dr. Shapiro, Dr. Moeller.

Covers principles of radiation protection, interaction of ionizing particles with matter, the concept of radiation dose from external and internal sources, dose calculations, and radiation measurements.

ESP 271b. Occupational and Environmental Radiation Protection (One half of ENG SCI 278)

Not given 1986–87; offered alternate years. Lectures, demonstrations. *Two 2-hour sessions each week.* 2.5 units. Dr. Shapiro, Dr. Moeller.

Covers biological effects of radiation; radiation epidemiology; radiation protection standards and regulations; laboratory, industrial, and environmental sources of radiation; and methods of environmental and occupational radiation protection.

Prereq. ESP 270a or equivalent.

HPM-ESP 277c. Environmental Health Policy Analysis

Lectures, case discussions. *Two 2-hour sessions each week.* 2.5 units. Dr. Thomas, Dr. Roberts, Dr. Evans.

(Course described under Health Policy and Management.)

ESP 300abcd. Tutorial Programs

Time and credit to be arranged.

Opportunities are provided for individual tutorial work for qualified students in the fields of respiratory biology, respiratory epidemiology, occupational medicine, industrial hygiene and ventilation, aerosol technology, radiological health, medical radiation physics, nuclear medicine, solid waste management, air pollution control, and environmental health management.

ESP 330c. Field Work

One-week period between fall and spring terms. 1 unit.

A week of supervised field observation is offered to students, who may choose appropriate visits to medical or industrial hygiene departments of industries, airports, and other agencies which have operations or research in the field of environmental health. Field work arrangements are generally made early in the fall term.

ESP 350. Research

Doctoral students may undertake theoretical, laboratory, or field research under the direction of faculty members working in the following areas:

Air Pollution

Dr. First, Dr. Spengler, Dr. Ryan, Dr. Yanagisawa, Dr. Ferris, Dr. Spelzer.

Industrial gas cleaning, personal exposure monitoring, assessing air pollution potential from simple and complex pollution sources, indoor air pollution, health effects of air contaminants, epidemiology.

Environmental Health Management

Dr. Moeller, Dr. Hornig, Dr. Harrington, Dr. Evans.

Quantitative methods of environmental management, risk analysis, environmental standards, and criteria.

Industrial Hygiene

Prof. Burgess, Dr. Ryan, Dr. Evans.

Monitoring exposures of occupational groups to toxic air contaminants, aerosol, physics, and ventilation; ergonomics applications to job design.

Inhalation Toxicology

Dr. Brain, Dr. Valberg.

Biological responses to inhaled particles and gases, deposition and clearance mechanisms.

Mathematical Physiology

Dr. Feldman, Dr. Butler.

Modeling of organ systems, experimental design.

Occupational Health

Dr. Monson, Dr. Eisen, Dr. Greaves, Dr. Robins.

Epidemiological and field studies, health hazard evaluation.

Radiological Health

Dr. Moeller, Dr. Shapiro.

Reduction of dose from sources of natural origin, radiation safety criteria and standards, control of radioactive contamination.

Respiratory Mechanics

Dr. Mead, Dr. Banzett, Dr. Loring, Dr. Drazen.

Physiological measurement of respiratory function.

Solid Wastes

Dr. First.

Incineration of solid wastes, including municipal, radioactive, biological, and laboratory materials.

The following courses, offered in the Harvard Faculties of Arts and Sciences and Government, and at the Massachusetts Institute of Technology, are open to qualified students from the School of Public Health and may be of interest to students of environmental health sciences.

Economics 1551. The Political Economy of Environmental Quality

Half course (*spring term*). Tu., Th., at 12.

Dorfman.

Prereq. Social Analysis 10 or permission of the instructor.

Engineering Sciences 162. Hydrologic Cycles

Half course (*fall term*). Tu., Th., 10-11:30.

Fiering.

Prereq. Applied Mathematics 21b and one year of college-level physics.

Engineering Sciences 163. Introduction to Environmental Microbiology

Half course (*fall term*). M., W., 1-2:30.

Mitchell.

Prereq. College course in basic biology.

Engineering Sciences 260. Engineering Systems for Environmental Control

To be given 1986–87; offered alternate years.

Half course (*spring term*). M., W., F., at 10.

Harrington.

Prereq. Engineering Sciences 123 or permission of the instructor.

Engineering Sciences 264. Chemical Aspects of Natural and Polluted Waters

Half course (*spring term*). Tu., Th., 1-2:30.

Butler.

Prereq. Physical chemistry (e.g., Chemistry 10 or Engineering Sciences 161), and some experience with biology and geology.

M-113. Analytic Frameworks for Policy

Half course (*fall term*). M., W., 9:30-11:00.

Zeckhauser.

Prereq. Microeconomic theory, optimization, and decision analysis.

S-114m. Issues in Hazardous Waste Management

Modular course (*spring term*). Hours to be arranged.

O'Hare.

MIT 1.143J. Mathematical Optimization Techniques

Nine units (*fall term*). Hours to be arranged.

Marks, Psarftis.

MIT 1.811J. Environmental Law: Pollution Control

Nine units (*fall term*). Ashford, Heaton.

MIT 1.812J. Regulation of Chemical Toxins, Radiation and Biotechnology

Nine units (*spring term*). Ashford, Caldart, Hattis.

MIT 1.83. Organic Compounds in Aquatic Environments

Nine units (*fall term*). Gschwend.

MIT 10.805J. Technology, Law and the Working Environment

Nine units (*fall term*). Ashford, Caldart.

MIT 15.065. Decision Analysis

Nine units (*fall and spring terms*). Hours to be arranged. Kaufman.

MIT 15.074. Mathematical Models and Policy Analysis

Nine units (*spring term*). Tu., Th., 1-2:30

Barnett.

Prereq. Statistics.

■ EPIDEMIOLOGY

Note: Either EPI 200a or EPI 201a satisfies the school requirement of an introductory course in epidemiology. However, individual programs may require one or the other.

EPI 200a. Applications of Epidemiology in Public Health

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Maclure, Guest Lecturers.

Using the case method, this course shows public health practitioners that whether they are reporting disease, investigating causes, consulting on research, communicating to the public, prescribing to patients, planning a program, managing a health organization, or changing policy, epidemiologic problems, methods, and results will often influence their work. Epidemiologic terms and concepts are illustrated and discussed, but neither as deeply nor as quantitatively as in EPI 201a. Recommended for students who do not plan to take more than the minimum school requirement in epidemiology. Students who plan to take further courses in epidemiologic methods are advised to take EPI 201a. Credit cannot be received for both this course and EPI 201a.

EPI 201a. Introduction to Epidemiology

Lectures and seminars. *Two 1-hour and one 2-hour sessions each week. 2.5 units.* Dr. Mueller.

Introduces the basic principles and methods of epidemiology. Lectures are complemented by seminars devoted to exercises or to the discussion of current examples of epidemiologic studies. This course leads into EPI 202b and is recommended for all students who wish to take more than the minimum school requirement. Credit cannot be received for both this course and EPI 200a.

EPI 202b. Epidemiologic Reasoning and Practice

Lectures, seminars. *Two 1-hour and one 2-hour sessions each week. 2.5 units.* Dr. Maclure.

Presents the principles of problem conceptualization, study design, analysis and inference, and emphasizes learning theoretical issues through practical exercises. Serves as an introduction to more advanced study or as a final course for students at the master's level desiring a working familiarity with epidemiologic methods.

Prereq. EPI 201a or, with permission of the instructor, EPI 200a.

EPI 203c. Cohort Studies

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Walker. Examines common problems in the design, analysis, and interpretation of cohort studies. Problems of exposure and disease definition, time dependent effects, confounding, and misclassification are considered in the light of data sources typically

available. Relevant statistical methods are introduced but developed in detail only insofar as they affect study design.

Prereq. A grade of B or better in EPI 201a, EPI 202b, BIO 200a or 201a, and BIO 202cd. BIO 202cd may be taken concurrently with permission of the instructor.

EPI 204d. Case-Control Studies

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Walker. Extends the discussions initiated in EPI 203c to studies in which information on the population at risk is derived from sample-based data. Implications of case and control selection procedures are discussed in detail, as are the application in case control studies of the concepts and analytic procedures developed for cohort studies.

Prereq. EPI 203c.

EPI 205cd. Practice of Epidemiology

Tutorials, seminars. *Tutorial sessions during "c" period; one 2-hour seminar each week during "d" period. 2.5 units.* Dr. Willett, Dr. Hutchison, Dr. MacMahon. The seminars consist of student presentations of plans for collection and analysis of epidemiologic data, with discussion by students and faculty. Preparatory work is done under tutorial arrangements with members of the faculty. The emphasis will be on conceptual issues and not on execution.

Prereq. EPI 202b and permission of the instructor. Enrollment limited to 16 students.

EPI 212d. Epidemiology of Cardiovascular and Respiratory Disease

Lectures. *One 2-hour session each week. 1.25 units.* Dr. Hutchison.

Reviews the epidemiology of the chronic cardiovascular and respiratory diseases. Demographic distribution and time trends of these diseases are presented, and known risk factors are discussed.

EPI 213c. Epidemiology of Cancer

Lectures. *One 2-hour session each week. 1.25 units.* Dr. Mueller.

Reviews basic concepts and issues central to cancer epidemiology. Considers the descriptive epidemiology of cancer and discusses the implications of the biology of cancer for identification of risk factors. Examines the role of smoking, radiation, hormones, nutrition, and viruses. Each student prepares a review of the epidemiology of a specific cancer site.

Prereq. EPI 200a or 201a.

EPI 214d. Epidemiologic Analysis of Outbreaks of Infectious Disease

Lectures. *One 2-hour session each week. 1.25 units.* Dr. E. H. Kass, Dr. Richard Platt, Dr. Jonathan Freeman (Harvard Medical School).

Discusses the use of epidemiologic methods in analyzing episodes of infectious disease. Various types of outbreaks and various methods of analysis will be illustrated. Literature review and practical methodology will be stressed.

EPI-ESP 215cd. Case Studies in Environmental and Occupational Epidemiology

Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Monson, Dr. Robins.

This course has three objectives: (1) to review methods used in evaluating the health effects of physical and chemical agents in the environment, (2) to review available evidence on the health effects of such exposures, and (3) to consider policy questions raised by the scientific evidence. Includes lectures on methodology, seminars on the review and criticism of current literature, and presentations by outside experts on the evaluation and impact of epidemiologic data.

Prereq. EPI 201a and BIO 200ab or BIO 201ab.

NUT-EPI 216ab. Nutritional Epidemiology

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Willett, Mrs. Witschi. (Course described under Nutrition.)

EPI 217b. Disease Definition and Methods in Psychiatric Epidemiology

Lectures. *One 3-hour session each week. 2.5 units.* Dr. Tsuang.

Presents the application of basic epidemiologic concepts and methods in psychiatric research. Topics include reliability, validity, analytic methods such as screening, use of case control vs. cohort designs, and use of experimentation vs. quasi-experimentation, and estimates of morbidity and mortality, as they specifically relate to psychiatric research.

Prereq. EPI 200a or EPI 201a, BIO 200ab or BIO 201ab.

EPI 218c. Readings and Risk Factors in Psychiatric Epidemiology

Lectures. *One 3-hour session each week. 2.5 units.* Dr. Tsuang.

Covers a range of readings from the early classics to recent work on the occurrence and distribution of psychiatric illnesses. Topics include case identification and classification, treated vs. true rates, early classics in psychiatric epidemiology, effects of treatment, effects of risk factors on true and treated rates.

Prereq. EPI 200a or EPI 201a, BIO 200ab or BIO 201ab; EPI 217b recommended.

EPI 219d. Assessment Methods in Psychiatric Epidemiology

Lectures, seminars, and an outside practicum involving interviews. *One 2-hour session each week. 2-4 hours practicum each week. 2.5 units.* Dr. Murphy.

Focuses on four well-known interview schedules designed to identify psychiatric disorders and to provide diagnoses. Topics covered include the history of such instruments as well as their construction, reliability, validity, and appropriateness for different kinds of studies. Practical experience in administering and analyzing the responses to such interviews plays a central role in the course.

Prereq. EPI 217b, EPI 218c.

EPI 220cd. Readings in the History of Epidemiology (FAS History of Science 292r) Seminars. *One 2-hour session in Cambridge and one 1-hour session at HSPH each week. 5 units.* Dr. Rosenkrantz, Dr. Brandt.

Focuses on the history of the classic texts in modern epidemiology as they have reflected changing views of the etiology of disease. Emphasizes the analysis of primary documents and their impact on medicine and public health. Each student completes a research project and writes it up in the format appropriate to a professional journal. Students are expected to have adequate preparation in the quantitative social sciences.

EPI 221b. Pharmacoepidemiology

Lectures. *One 2-hour session each week. 1.25 units.* Dr. Richard Platt (Harvard Medical School).

Issues related to the discovery and quantification of drug-related illness will be covered in case studies of historically important examples and through presentation of methods currently in use for the formal collection of new data.

EPI 222c. Diabetes Mellitus and Its Complications: Epidemiologic and Genetic Approaches

Lectures. *One 2-hour session per week. 1.25 units.* Dr. MacMahon, Members of the Department.

Uses the pathophysiology and descriptive epidemiology of diabetes to illustrate the generation of etiologic hypotheses. Genetic models will be introduced together with examples of gene/environment interactions. Continuing with the descriptive epidemiology of the late complications of diabetes, probabilistic models of the natural history of a disease will be demonstrated. This will be integrated around the goal of optimizing a medical care model for preventing late complications.

Prereq. EPI 202b and permission of the instructor.

MCH-EPI 223b. Childhood Mental Disorders: Public Health Perspectives.

Lectures, seminars. *Two 2-hour sessions per week. 2.5 units.* Dr. Deykin, Dr. Rauh. (Course described under Maternal and Child Health.)

ESP-EPI 235ab. Critical Review of the Scientific Basis for Occupational Standards

Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Eisen, Dr. Robins, Dr. Monson. (Course described under Environmental Science and Physiology.)

EPI 300abcde. Tutorial Programs

Time and credit to be arranged.

Students may participate in departmental research in close association with a staff member. Time and credit are to be arranged with the chairman of the department.

EPI 350. Research

In selecting topics for research in doctoral programs, students should consider the fields in which members of the department are currently working. These include:

Neoplastic Disease

Dr. MacMahon, Dr. Boyle, Dr. Hsieh, Dr. Hutchison, Dr. Maclure, Dr. Monson, Dr. Mueller.

Environmental Epidemiology

Dr. Monson.

Epidemiologic Methods

Dr. Walker, Dr. Hsieh.

Nutritional Epidemiology

Dr. Willett.

Virus-Associated Chronic Disease

Dr. Mueller.

Biochemical Epidemiology

Dr. Maclure.

Psychiatric Epidemiology

Dr. Tsuang.

■ HEALTH POLICY AND MANAGEMENT

HPM 104a. Introduction to Selected Medical Problems for Non-Physicians

Lectures, discussions. *One 2-hour session each week. 1.25 units.* Dr. Braun.

Provides students who have limited backgrounds in biology and medicine with an introduction to medical terminology and sources of medical information. Topics include selected problems that bring patients to health care providers, approaches to differential diagnosis and treatment, and the pathophysiology of a major disease problem. Each student is expected to explore one diagnostic or therapeutic problem in detail in a paper. Required for students in the two-year Health Policy and Management Program General Track.

HPM 205ab. Economic Analysis for Public Health

Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Hemenway. Provides an introduction to the basic principles of economics and economic analysis, particularly as they apply in the public health field. A systematic introduction to microeconomic theory includes the determinants of supply and demand, the theory of markets, and the concept of economic efficiency. Specific topics in health care economics include demand for health care, insurance, and the market for physician services.

May not be taken for credit by students enrolled in the two-year Health Policy and Management Program or by students who previously have taken HPM 206ab (formerly HPM 100ab).

HPM 206ab. Economic Analysis

Lectures, seminars. *Three 2-hour sessions each week. 7.5 units.* Dr. Hemenway.

Designed to bring students to an intermediate-level understanding of economic theory. Emphasizes the uses and limitations of the microeconomic approach.

Required for students in the two-year Health Policy and Management Program and is the first course in the policy sequence. May be taken for credit by students who previously have taken HPM 205ab only with permission of the instructor.

HPM 207ab. Economics of Health Policy

Lectures, discussions. *Two 1½-hour sessions each week. 5 units.* Dr. Hsiao.

Teaches students to use economic concepts and methods to analyze health policy issues. Applies analytical techniques to dissect complex policy problems and show what insights can be gained. Skills in using several analytical tools are developed, including economic modeling, systematic analysis, econometrics, and simulation. Health policy topics examined using these tools include national health insurance, reimbursement of hospitals



and doctors, pro-competition, and facility and manpower planning. Course especially appropriate for students interested in doing policy analysis for the public or private sectors.

Prereq. One semester each of statistics and microeconomics.

HPM 214d. Meta-Analysis of Clinical Trials and Their Impact on Medical Efficiency

Seminars, tutorials. *Two 1½-hour sessions each week. 2.5 units, plus additional units for tutorial.* Dr. Chalmers and Members of the Faculty.

Designed as a follow-up to BIO 214c. Concerned with the place which clinical trials have in practice of preventive, diagnostic, and therapeutic medicine. Students learn to evaluate, conduct, coordinate, and combine clinical trials.

Related tutorials are conducted throughout the year. Students conduct meta-analysis in a field of their choice. Guidance and collaboration are given in searching literature for RCTs on diagnostic evaluations, gathering and analyzing data, and preparing abstracts for presentation at national meetings and publication of manuscripts in peer-review journals.

Prereq. An interest in the application of the scientific method to the prevention, diagnosis, and treatment of disease.

HPM-BIO 219b, 219c, 219d. Statistical Methods for Health Policy and Management (Module I, II, III)

Lectures. *Three 2-hour sessions each week. 2.5 units each period.* Dr. Anderson, Dr. Mehta.

Introduces students to probability and statistics, emphasizing their application in a variety of health policy and management contexts. Goals include establishing an awareness of basic statistical reasoning and recognition of common difficulties in application. The MINITAB package will be used throughout.

Module I(b): Topics include distributions, data display, conditional probability, confidence intervals, hypothesis testing, testing means and proportions, and p-value.

Module II(c): Topics include representative sampling, power, study design, sample size determinations, clinical trials, contingency tables, life tables, goodness of fit tests, rate adjustment, non-parametric methods, and analysis of categorical data.

Module III(d): Topics include correlation, simple linear regression, analysis of variance, multiple regression, discriminant analysis, and forecasting.

All three modules are required for students in the two-year Health Policy and Management Program and in the management or policy curricula of the one-year Health Services Administration Programs.

Sections will be graded separately. May not be taken for credit by students who previously have taken BIO 200ab or BIO 201ab. If substituted for BIO 200 ab or BIO 201ab, all three modules must be taken.

Prereq. One college-level course in mathematics.

Enrollment of students not in the Department of Health Policy and Management subject to approval of the instructors.

HPM 220ab/220cd. Administrative Systems

Lectures, seminars. *Three 2-hour sessions each week. 5 units each term.* Dr. Barrett, Members of the Department.

Examines issues related to managing health care organizations and develops skills in a variety of functional areas, including organizational theory, institutional strategy, leadership, change and conflict, financial accounting and analysis, cost accounting, operations management, marketing, and management control systems. Classes rely principally on the case method of instruction.

Required for students in the two-year Health Policy and Management Program. HPM 220ab may be taken separately by other students, but only HPM 220ab/220cd is an acceptable substitute for HPM 221ab. HPM 220cd may not be taken separately. May be taken for credit by students who previously have taken HPM 221ab.

HPM 221ab. Managing Health Delivery Organizations

Lectures, seminars. *Two 2-hour sessions each week. 5 units.* Dr. Henn.

Introduces the management of health delivery organizations in industrialized and less developed countries. Topics include organizational issues, financial management, cost accounting, management control systems, and institutional strategy. Combines cases, lectures, and speaker presentations, supplemented by topical readings, as a vehicle for analyzing management problems and evaluating alternative solutions. Relevant managerial concepts and theories are introduced.

Either HPM 221ab or HPM 220ab/220cd is required for students in the MPH program. May not be taken for credit by students enrolled in the two-year Health Policy and Management Program or by students who previously have taken HPM 220ab/220cd.

HPM 231cd. Strategic Planning and Organization Design

Case discussions, lectures. *Two 2-hour sessions each week. 5 units.* Dr. Sapienza.

Includes two conceptually distinct portions: industry/environmental analysis and organizational design. The first portion provides the foundation and tools for determining strategy. Once strategy is defined, the manager's next task is to design the organization to achieve that strategy. Using a variety of materials, students will be exposed to such design issues as differentiation, matrix organization, technology, and social structure. The final sessions address implementation of design changes.

HPM 232b. Intervention Strategies in Complex Health Organizations

Seminars, case studies, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Barrett, Mr. Lorch.

Covers the range of consulting models that are frequently used by health care organizations in both the private and the public sectors. Presents specific interventions by both client and consultant; analyzes each situation in terms of the problem which led to the engagement of a consultant, the obstacles to arriving at a solution, and the success or failure of the intervention.

Prereq. HPM 231cd (starting 1987-88).

HPM 233b. Health Care Marketing Applications

Not given 1986-87.

Seminars, case studies, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Barrett.

Examines various marketing applications in domestic health services, international underdeveloped areas, and social marketing contexts. Specific marketing techniques are addressed within a strategy framework.

Prereq. Previous coursework in marketing (i.e., HPM 220ab/220cd or equivalent) and permission of the instructor.

Primary course instructor is Ms. MacCracken.

HPM 234c. Financial Control in Health Care

Case studies. *Two 2-hour sessions each week. 2.5 units.* Members of the Department.

Discusses issues of cost containment and financial control in health care from both a managerial and public policy perspective, develops a conceptual structure for approaching them, and examines how regulatory control systems might be designed to accommodate the unique characteristics of health care systems. Topics include cost comparisons, capital formation, the role of physicians, management control systems, and regulatory control. Uses both cases and readings. Includes some international as well as US materials.

Prereq. HPM 220ab/220cd or equivalent.

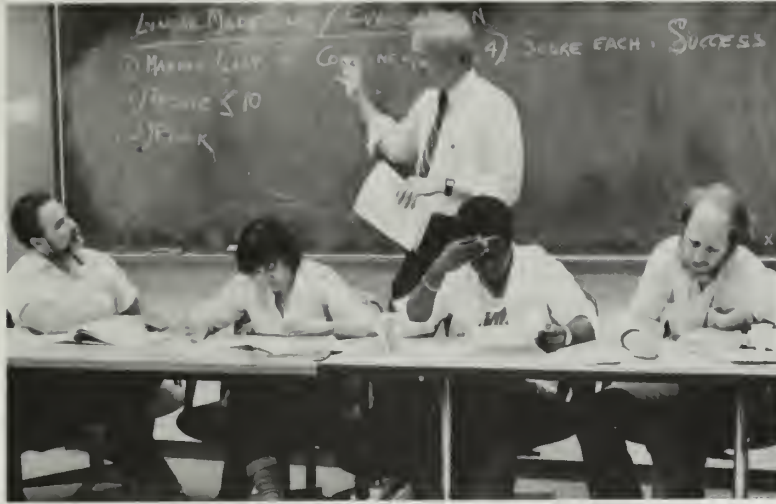
Primary course instructor is Ms. Hannon.

HPM 235d. Seminar on Current Issues in Health Administration

Seminar. *One 3-hour session each week. 1.25 units.* Dr. Kasten.

Designed to be a state-of-the-art review and analysis of all factors involved in containing hospital costs: providers, intermediaries, regulators, planners, employers, unions, and consumers. First half of class session will be a discussion of relevant literature; second half will be a series of presentations/interactions with outside representatives of specific cost containment efforts.

Auditing not permitted.



Dr. Albert Henn, Lecturer on Health Policy and Management, provides students with a model for evaluating health programs in developing countries.

HPM 236cd. Management in the Health Care Industry (HBS 1344)

Lectures. Two 1½-hour sessions each week. 5 units. Dr. Herzlinger, Dr. Rhea (Lecturer, Harvard Business School), Dr. Kane.

Focuses on the management issues in health care institutions including those that deliver health care (hospitals and free-standing facilities); that insure the provision of health care; that supply drugs, equipment, MIS services, and hospital supplies; that provide research in bio-technology; that provide capital; and that regulate the industry. Explores the strategic choices offered by the newly competitive structure of the industry and the managerial policies needed to execute these choices.

Prereq. HPM 220ab/220cd or equivalent, by permission of the instructor. It is strongly recommended that students take HBS 1303, *Analysis of Corporate Financial Reports*.

HPM 237b. A Social Marketing Approach to Health Promotion in International Health

Lectures, case studies. Two 2-hour sessions each week. 2.5 units. Dr. Henn. Provides an introduction to the field of social marketing, the systematic use of techniques derived from modern advertising, marketing, and social science research to improve the health-related behaviors of vulnerable populations. Introduces students to the analytical and technical skills needed to design, implement, and evaluate health-related social marketing interventions. Much of the case material will be drawn from the Third World setting.

Primary course instructors are Dr. Koch-Weser and Mr. Israel.

HPM 238d. Managing Management Information Systems

Lectures, discussions. Two 2-hour sessions each week. 2.5 units. Members of the Department.

Examines issues relating to effective management of computer-based management information systems. Although some technological issues are addressed on occasion, the principal focus of the course is on topics of systems analysis and design, MIS strategies, and organizational behavior, rather than technology. Uses case method instruction, supplemented by topical readings to focus on the role of a manager in assuring the success of an organization's MIS effort. Includes some international as well as US materials.

Prereq. HPM 220ab/220cd, HPM 221ab or equivalent.

Primary course instructor is Ms. Gougeon.

HPM 239a. Financial Analysis in Health Care

Lectures, discussions. Two 2-hour sessions each week. 2.5 units. Dr. Barrett. Provides the opportunity to develop advanced skills in financial accounting and analysis of financial reports. Covers fund accounting, accounting for inflation, analysis of financial statements, and funds flow. Cases draw on both hospitals and other nonprofit organizations.

Prereq. HPM 220ab/220cd or equivalent.

Primary course instructor is Ms. Hannon.

HPM 240a. Toward an Agenda for Public Health

Lectures, discussions. Two 2-hour sessions each week. 2.5 units. Dr. Roberts. Provides an overview of the problems of setting priorities in public health. Examines the burden of illness in both advanced and developing societies and the causal role of environmental, economic, and behavioral factors. Discusses ways to measure the burden of ill health and alternative

assumptions and implications. Examines ethical positions on how resources should be allocated, and the view of man and society they presume.

Required for students in the Health Policy and Management Department.

HPM 241b. Health Care Delivery in the US: History and Sociology

Lectures, discussions. One 3-hour session each week. 2.5 units. Members of the Department.

Offers an introduction to contrasting sociological and historical accounts of the US health care sector. Historical materials and contemporary case studies are used to analyze the roles of providers, patients, and other political, cultural, and social factors in determining the current objectives and institutional arrangements in this sector. The central role of physicians and "medical science" in health care is emphasized, and its implications for institutional reform explored.

Required for students in the two-year Health Policy and Management Program General and Medical/Dental Tracks.

Prereq. HPM 240a.

Primary course instructor is Dr. Plough.

HPM 242c. The Role of Government in the US Health Care System: Political Analysis

Lectures, discussions. Two 2-hour sessions each week. 2.5 units. Dr. Feldman. Introduces political analysis, using several models to examine the development and implementation of policies and programs affecting the US health care system. Topics include legislative politics, bureaucratic politics, and intergovernmental relations, as well as government's role in financing, delivering, and regulating health services. Required for students in the two-year Health Policy and Management Program General and Medical/Dental Tracks.

Prereq. HPM 205ab, HPM 206ab, or equivalent, by permission of the instructor.

HPM 243d. Economic Analysis of the US Health Care Delivery System

Lectures, discussions. Two 2-hour sessions each week. 2.5 units. Dr. Hsiao. Introduces health economics, using economic analysis to examine major health care delivery issues and the development of policies and programs designed to address them. Topics include health care finance, health care access and utilization, the supply of and demand for medical care services, health care regulation, and competition and national health plans. Required for students in the two-year Health Policy and Management Program General and Medical/Dental Tracks.

Prereq. HPM 205ab, HPM 206ab, or equivalent, by permission of the instructor.

HPM 244cd. Community Health Planning and Regulation

Lectures, discussions. Two 2-hour sessions each week. 5 units. Dr. J. Brown. Introduces and critiques governmental and voluntary arrangements to influence health

system behavior and development on a community-wide basis. After a brief introduction to planning theory and current health planning activities, teaches and critiques basic technical planning methods in areas such as need and demand estimation, standard setting, and area-wide incremental cost analysis. Also teaches political leadership and staffing skills for community planning efforts. Concludes by mapping possible future US health system futures and considering the roles of community-based planning in these futures. Designed for students interested in long-term change in the US health system, for students preparing for leadership positions in the public or private sectors, and for students considering careers in health planning organizations.
Prereq. Course work or background in cost accounting and health economics.

HPM-BEH 245c. Setting and Implementing Priorities in Public Health: The Science and Politics of Health Promotion
Lectures, discussions. *One 3-hour session each week. 2.5 units.* Members of the Department, Guest Lecturers. Provides a framework for setting priorities in public health resource allocation. Reviews epidemiologic and intervention studies on lifestyle and environmental risk factors for heart disease, cancer, and cerebrovascular disease. Examines economic and political dimensions of mass risk factors. Analyzes strategies for gaining support for and designing health promotion programs. Primary course instructor is Dr. Havas.

HPM 246b. The Allocation of Health Resources
Seminars. *One 2-hour session each week. 1.25 units.* Dr. Hiatt. Considers the background of the problem of allocating health resources in the US and considers possible responses to its challenges. Discusses the stress placed on health resources by increasing medical capabilities, needs, and demands, and the disparity between what we can do and what we can afford to do.
Prereq. HPM 240 and permission of the instructor.

HPM 247d. Injuries and Public Policy
Seminars, case studies, lectures. *One 3-hour session each week. 2.5 units.* Dr. Hemenway. Introduces students to the problem of injury, from a social science perspective. Discusses and analyzes approaches to understanding the problem, and policies to mitigate the consequences of both accidental and intentional injury. Specific categories of injury, such as fires, drowning, and motor vehicle collisions are examined in detail.
Prereq. HPM 240a and HPM 205ab or HPM 206ab, or equivalent preparation.

HPM 248ab. Contemporary Issues in Health Policy
Seminar. *One 2-hour session each week. 2.5 units.* Dr. Calkins. Examines health policy issues of current

political importance. Issues to be considered may include hospital and physician payment, financing of long-term care services, dissemination and regulation of medical technology, and access to health services for the poor. Analysis will focus on definition of policy goals, identification of policy options, and assessment of both substantive and political consequences of specific policy choices.
Prereq. HPM 240a, HPM 241b, HPM 242cd, or the equivalent introduction to economic and political analysis of the health care system.

HPM 249a. Power Centers and Interest Groups Affecting Health Management Decisions.
Seminars, lectures, discussions, case studies. *Two 2-hour sessions each week. 2.5 units.* Dr. Barrett.

Focuses on the often adversarial power centers and interest groups that health care managers encounter in trying to advance their organization's objectives. From background readings and lectures, students explore the perceptions, motivations, objectives, and constraints that drive managers' decisions, and the decisions of others with whom they must deal. For students planning to enter management positions in health care delivery.
Prereq. Completion of the first year of the Health Policy and Management Program, or permission of the instructor. Primary course instructor is Mr. Kinzer.

HPM 250d. Policy Implementation
Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thomas. Intended to help students think systematically about some of the reasons public programs succeed or fail. Assumes that the choice of appropriate and effective institutional arrangements for accomplishing policy goals is itself an important policy question. Examples are taken from a variety of policy areas.
Required for students in the two-year Health Policy and Management Program, and is the third course in the policy sequence.
Presumes knowledge of material presented in HPM 205ab or HPM 206ab and HPM-BIO 280c.

HPM-MCH 252ab. Public Health Law and Human Rights

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Mariner. Provides an introduction to the US legal system as it affects health care. Emphasizes concepts of law governing public health programs and distinguishing between legal and moral rights and between legal and policy issues. Among topics considered are methods of regulating health, safety, and competition; rights to medical care; rights of medical patients, the mentally ill, children, and research subjects; due process; equal protection; resource allocation; and problems of balancing personal rights and community protection. Auditing and convenience attendance not permitted.

HPM 253e. Government and Private Funding for Research and Health Care Programs

Lectures, discussions, workshops. *Time to be arranged. 1 unit.* Members of the Department.

To carry out research or develop needed health care programs, managers and policy analysts need to be able to obtain funding from federal, state, and local government sources, and from foundations and corporations. This course aims at enabling participants to demonstrate in a clear and concise proposal an understanding of the issues and facility with methodological design, and to explore potential sources of funding. Requirements for proper administration of funds are also discussed. Proposals are prepared and critiqued in the workshops.

Prereq. Exposure to research issues in health care or program development. Students should enroll during the first week of b period (by November 21, 1986). Primary course instructor is Dr. Dumbaugh.

HPM 254c. Risk Management Programs, Quality Controls, and Compensation Policies

Not given 1986-87.
Lectures. *Two 2-hour sessions each week. 2.5 units.* Prof. Curran. Focuses upon the development, implementation, and evaluation of risk management programs and legislative reforms in patient compensation plans. Attention is given to medical and hospital malpractice experience, key legal decisions in the area, and legislative reform movements setting up arbitration, screening panels, tort-law changes, no-fault mechanisms, etc. The interrelationship of quality of care standards and quality assurance to malpractice vulnerability and risk management programs is a primary focus of attention.
Prereq. HPM 257b and HPM 258d advised, but not required.

HPM 255d. Reimbursement Systems

Seminars. *Two 1½-hour sessions each week. 2.5 units.* Dr. Kane. Examines issues related to the general theme of third-party reimbursement for health care institutions. The principal focus is on hospitals. Issues include cost containment efforts, hospital perspectives, and the role of incentives. Some specific systems are examined in detail in order to assess the feasibility of certain techniques and to address questions of overall reimbursement system design.
Prereq. Introductory courses in financial and cost accounting recommended.

HPM 256c, 256d. Financing Health Care (Module I, II)

Lectures, case studies. *Two 2-hour sessions each week. 5 units.* Dr. Hsiao. Introduces the major public and private approaches to financing health care. Analyzes the economic considerations in financing: equity, efficiency, and stability. Evaluates impact of financing on access, risk pooling, cost inflation, and technology

diffusion. Module I (HPM 256c) analyzes the stages of economic development and health care financing. Module II (HPM 256d) focuses on financing methods in developed nations. Each module may be taken separately.

Prereq. HPM 205ab or HPM 206ab and permission of the instructor.

HPM 257c. Physician Performance

Seminar. *Two 2-hour sessions each week. 2.5 units.* Dr. Calkins.

Examines factors influencing physician practices and the quality of physician services. Issues discussed include the role of education, specialization, experience, organizational setting, financial incentives, and malpractice. Considers strategies for changing physician practices with respect to diagnostic testing, treatment, and patient education. Experience in medical care delivery an advantage, but not required.

Course is followed by the optional sequel HPM 258d.

HPM 258d. Evaluation of Quality of Health Care

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Palmer, Visiting Lecturers.

Examines issues in defining "quality in health care" and the choice of methods for assessing and improving quality of health care. Recent research is reviewed and operating programs, including the PRO program, are analyzed. Includes a workshop on designing a medical care evaluation in an ambulatory care facility. Visiting lecturers describe quality of care evaluation programs in hospital and laboratory settings.

Additional sequel to HPM 254c and HPM 257b.

HPM 262cd. Health Planning and Policy for Developing Countries

Lectures, seminars. *Two 2-hour sessions each week.*

Laboratory. *One 1-hour session each week (optional). 5 units.* Dr. Shepard.

Deals with skills needed for health planning through lectures, problems, and case studies. Strong emphasis is placed on the economic analysis of health issues in developing countries. Concepts and techniques of cost-effectiveness analysis, recurrent cost analysis, and monitoring of the delivery of health services are taught, applied to health care programs, and practiced with examples. Class is divided into groups which use these techniques to analyze a planning problem and report their findings through presentations and a memorandum.

ID 209a or experience in developing countries is recommended, but not required. A background in economics is not required.

POP-HPM 263c. Case Studies in Design and Management of Population and Community Health Programs

Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Wyon, Dr. Harkness.

(Course described under Population Sciences.)

ESP-HPM 264b. Operations Management

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Evans, Dr. Shepard.

(Course described under Environmental Science and Physiology.)

HPM 266d. Program Implementation in Developing Countries

Not given 1986-87.

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Henn.

Provides an overview of the circumstances in developing countries which affect the implementation of health programs. Assists students in the adaptation and application of management techniques to deal with typical third world health program implementation issues. Topics include decentralized management, manpower development, community participation, financing, supervision and motivation, logistics, evaluation and redesign, information system development, and donor coordination.

HPM 267d. Political Economy of International Health

Seminars, case discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Reich, Dr. Shaikh.

Examines critical health issues of developing countries in the larger international context of politics and economics. Explores how the relationships between developed countries and developing countries affect the management of health problems and policy. Students are introduced to two contrasting perspectives on development and health: modernization theory and dependency theory. Six case studies are discussed in class to illustrate the constraints and the opportunities created for health professionals by the international complexities of domestic health problems.

HPM 268c. Comparative Health Policy in Industrialized Countries

Seminars. *One 2-hour session each week. 1.25 units.* Dr. Reich.

Uses comparative analysis to identify similarities and differences among health policies of industrialized countries, to seek explanations for similarities and differences, and to explore social, economic, and health consequences of different policies. Examines various approaches to comparative study. The course is organized around issues rather than countries; the issues include ideology, structure, financing, indicators of effectiveness, environmental policy, and pharmaceutical policy.

HPM 270c. Issues in Mental Health Policy

Seminars, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Shore, Dr. Dorwart.

Reviews the historical development and current status of policy issues relevant to mental health and mental illness. Detailed

attention will be given to the role of government and to identifying areas where further research is needed.

HPM 274abcd. Dental Care Administration Research Seminar (HDS DCA 222)

Lectures, seminars. *One 3-hour session each week. 5 units.* Dr. Douglass.

The fall term concentrates on the research methods of current national studies of the need, supply, demand, and cost of dental care. Policy documents of the ADA, IOM, OTA, Research Triangle Institute, RAND Corp., and the NCHS are studied. Research designs and data collection methods are reviewed. The spring term emphasizes the research work of faculty and students on relevant dental care policy and management subjects. Grade is based upon participation and the defense of a current research project.

HPM 275ab. Dental Public Health and the Dental Care Delivery System

Seminars, case studies, lectures. *One 2-hour session each week. 2.5 units.* Dr. Antczak, Members of the Department

Reviews basic concepts in dental public health and the dental care delivery systems in the US and other countries. Examines issues of utilization of services, need versus demand for dental care, methods of quality assurance, and the role of government agencies in the provision and regulation of dental care. The effects of alternative methods of financing dental care on utilization and provider incentives will also be discussed.

HPM 276cd. Oral Diseases and the Evaluation of Dental Care

Seminars. *One 2-hour session each week. 2.5 units.* Dr. Antczak.

Examines basic concepts in the epidemiology of oral diseases and reviews changes in disease prevalence. Discusses the measurement of oral health status and the translation of oral health status into treatment needs for planning purposes. Methods of evaluating dental care are also covered, including clinical decision making, research design, quality assessment of experimental evidence, and meta-analysis.

HPM-ESP 277c. Environmental Health Policy Analysis

Lectures, case discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Thomas, Dr. Roberts, Dr. Evans.

Using case studies, demonstrates the application of analytic skills to public policy design and implementation. The multidisciplinary approach emphasizes the technical uncertainties and the evaluative and institutional complexities surrounding environmental policy and management. Examples are drawn from air pollution, and from toxic and hazardous waste control.

Prereq. HPM 206ab or equivalent, ESP 201a and ESP 202b or equivalent. Required for students in the two-year Health Policy and Management Program Environmental Track.

HPM 279c. Quantitative Policy Analysis
Seminars, case studies, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Graham.

Introduces students to techniques for analyzing health problems quantitatively. Techniques include decision analysis, cost-effectiveness analysis, and benefit-cost analysis. Readings from health, safety, and environmental literature are used to illustrate the techniques and their limitations. This course or HPM-BIO 280c is required for students in the two-year Health Policy and Management Program. Course emphasizes applications to health policy, planning, and management.

Prereq. HPM 205ab or HPM 206ab or equivalent.

HPM-BIO 280c. Decision Analysis for Health and Medical Practices (KSG S-176m)

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Begg.

Concerns the methods and applications of decision analysis, cost-effectiveness analysis, and cost-benefit analysis in the evaluation of medical technologies and health programs. Stresses applications and limitations. Examples used to illustrate techniques include treatment decision for acute abdominal pain, coronary artery bypass surgery, cost effectiveness of pharmaceuticals, evaluation of immunization programs, and priority setting for applied biomedical research. Course emphasizes applications to medical technology assessment and health resource allocation.

Prereq. BIO 200ab or BIO 201ab or HPM-BIO 219b, 219c (may be taken concurrently) or equivalent introductory course in probability and statistics.

This course or HPM 279c is required for students in the two-year Health Policy and Management Program.

HPM-BIO 281d. Seminar on Clinical Decision Analysis

Seminar. *Two 2-hour sessions each week. 2.5 units.* Dr. Politser, Dr. Fineberg.

Intended to enhance the student's ability to conduct independent analyses of medical decisions. Didactic sessions will critically review published analyses and address selected topics, such as evaluation of diagnostic tests, utility assessment, and use of computer aids. Presumes knowledge of principles of decision analysis.

Required for students in the two-year Health Policy and Management Program Medical/Dental Track.

Prereq. HPM-BIO 280c or permission of the instructor.

HPM-BIO 282d. Cost-Effectiveness and Cost-Benefit Analysis for Health Program Evaluation

Seminars, lectures. *Two 2-hour sessions each week. 2.5 units.* Dr. Graham.

Topics include methods and applications of cost-effectiveness and cost-benefit analysis for health program evaluation, medical technology assessment, and environmental risk analysis; theoretical founda-

tions; "shadow" pricing; economic valuation of life saving; choice of discount rates; cost accounting applied to economic evaluation in institutional settings; methods for assessing costs of environmental controls; distribution-sensitive measures of social benefit and cost; health status indexes; ethical issues; and modern critiques. Students prepare a written critique of a published analysis and develop an independent analysis plan of their own choice.

Prereq. HPB 280c, HPM 279c, or equivalent; HPM 205ab, HPM 206ab, or equivalent.

HPM/BIO 283b. Behavioral Decision Theory in Health

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Politser.

Examines selected topics in the psychological study of how humans make decisions, with applications to medical decision making, health policy, health care management, and environmental decision making; subjective evaluation of probability and uncertainty; risk perception; framing effects; choice behavior; deviations from normative models; policy methods; the nature of human expertise; sources of variation in medical practices; and behavioral factors in the utilization and diffusion of technologies.

BIO-HPM 284a. Topics in Decision Theory

Lectures, seminars. *One 3-hour session each week. 2.5 units.* Dr. Politser.

(Course described under Biostatistics.)

BIO-HPM 285ab. Health Risk Assessment and Appraisal

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Bailer, Dr. Graham.

(Course described under Biostatistics.)

HPM 290abcd. Applied Research Seminar

Seminars. *One 2-hour session each week.* Field work. *One day each week. 10 units.* Dr. J. B. Brown, Dr. Feldman, Members of the Department.

Teaches students to apply analytic and managerial methods to concrete problems. Each student defines and proposes solutions to an important problem confronting an institutional sponsor. Students learn research methods and problem-solving techniques during the "a" period while developing project contracts with sponsors. In subsequent seminar meetings, students, sponsors, and faculty advisers present and discuss study methods and findings. Students also meet individually with seminar faculty and designated faculty research advisers. Students prepare a "problem/methods" paper during the first semester and final oral and written reports due at the end of the year.

Required for students in the two-year Health Policy and Management Program.

Prereq. Completion of the first year of the Health Policy and Management Program.

HPM 295ab. Doctoral Seminar on Research and Analysis

Not given 1986-87.

Seminar. *One 2-hour session each week. 2.5 units.* Dr. Roberts, Members of the Department.

Reviews the various research methods and analytic approaches that relate to public health and health policy. Explores how to design projects and choose methods appropriate to specific questions they address. The seminar is not intended to explore technical statistical issues, but rather to place research and analysis in their social, institutional, and policy context.

Prereq. Enrollment in the Health Policy and Management doctoral program and/or similar background and experience.

HPM 300abcde. Tutorials

Time and credit to be arranged.

Students may make individual arrangements to do work under the guidance of a member of the department. This work may include readings or special projects.

HPM 330e, 330f. Field Work

Time and credit to be arranged.

Students are assigned to work on special projects such as group surveys, other types of field projects, or observation of and limited participation in the work of health agencies. Field assignments are made on an individual basis to meet the needs of each student insofar as possible. Work in the field is coordinated with courses in the department and is offered through the Community Health Improvement Program.

HPM 350. Research

Doctoral candidates may register for HPM 350 to undertake individual study and research.

Attention is directed to courses described under Interdepartmental Courses.

The following courses, offered by the Faculties of Arts and Sciences and Government, are among those that may be of particular interest to students of health policy and management. They are open to qualified students from the School of Public Health.

Historical Study B-51. Disease and History: The United States and the Conquest of the "Great White Plague," 1842-1952
Half course (*spring term*). M., W., F., at 10. Rosenkrantz.

History of Science 145r. Social Science and Medicine in the United States, 1870-1940: Conference Course
Half course (*fall term*). W., 2-4. Rosenkrantz.

History of Science 249r. Readings in the History of Epidemiology: Seminar
Half course (*spring term*). W., 2-4. Brandt, Rosenkrantz.

Statistics 100. Introduction to Quantitative Methods
Half course (*fall term*). M., W., F., at 9. Mosteller.

S-171. Issues in Health Policy
Half course (*spring term*). M., W., 12:30-2:00. Blumenthal, Feldman.
Prereq. Enrollment in the Health Policy and Management doctoral program and/or similar background and experience.

■ MATERNAL AND CHILD HEALTH

MCH 200b. Growth and Development I
Lectures, self-instructional material. *Two 2-hour seminars/lectures weekly. 2.5 units.* Dr. Valadian.
Instruction in physical growth, development, maturation, and aging is presented in programmed, self-instructional material, and by weekly lectures. Covers topics necessary for the advanced study of growth and maturation and for population growth monitoring. Also provides an understanding of assets and needs which constitute a basis for health services.

MCH 202d. Growth and Development II: Factors Affecting Growth and Development
Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Valadian.
Explores definable influences that act on the course of physical growth and development from conception to maturity. Emphasis is placed on understanding the nature of the factor and its direct effects, as well as on how factors interrelate to produce some characteristics of mature individuals. This course also considers implications of factors for planning and providing health services and for future research.

MCH 203c. Primary Maternal and Child Health Care
Seminars, lectures, field visits. *Full-day sessions. 1.25 units.* Dr. Gardner.
Introduces the student to principles of organization and administration of primary health care services for mothers and children. Concepts of primary care, neighborhood health centers, and quality assurance are presented. Seminars focus on the issues and problems presented in the field visits. The community programs selected are diverse, including neighborhood health centers, private practice, hospital primary care, and HMO.
Enrollment limited to 12 students.

MCH 204ab. Content of Maternal and Child Health Programs
Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Gardner.
Components of health care programs for mothers and children are discussed as they vary to meet changing needs resulting from growth and maturational processes. Health programs appropriate to maternity, early and late childhood, adolescence, and youth are presented in terms of the multidisciplinary and interdisciplinary action they require. Also included are the historical and legislative background and the relationship of maternal and child health programs to social, mental health, education, and other systems; the course includes discussion of factors which shape current and future maternal and child health policies and services.

MCH 205cd. Planning, Implementation, and Evaluation of Maternal and Child Health Programs

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Walker.
Considers the organization and administration of national, state, and local health programs for mothers, infants, children, and adolescents, and services for children with handicapping conditions. Focuses on the development of skills in policy-formulation, needs assessment, planning, and evaluation of MCH programs in the US. Individual and small group projects are required.

MCH 206cd. Maternal and Child Health in Developing Countries

Seminars. *One 2-hour session each week. 2.5 units.* Dr. Valadian.
Parallels MCH 205cd. Emphasizes factors which shape MCH programs in rapidly changing social and cultural environments, particularly the interactions between health, nutrition, and poverty. Studies selected programs by age periods from various areas of the world and the processes of planning, financing, implementing, and evaluating such programs in relation to other sectors. Individual or small group case study projects are required.

MCH-NUT 207cd. Nutrition in Child Growth and Development

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.
Examines principles and practical problems encountered in the nutritional aspects of child growth and development. Lectures on general principles are designed to help students base their judgments on scientific evidence. Discussions deal with a variety of nutrition case studies and simulations illustrative of problems in both developing and highly industrialized countries.

MCH 208d. Rural Health Services

Not given 1986-87.
Seminars. *Two 2-hour sessions each week. 2.5 units.*
Lectures and discussions focus on the special problems of rural communities affecting MCH services delivery, cultural characteristics, resources available, and innovative approaches to problems, with selected examples in rural areas. Emphasis placed on doing needs/demands assessments or community diagnosis which structure planning for the health needs in isolated communities. Topics include transportation problems, environmental health hazards, and rural health concerns in developing countries.

MCH 209c. Services for Children with Disabilities

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Crocker.
Provides a review of the handicapping conditions of childhood: mental retardation, physical disability, sensory and commu-

nication disorders, and emotional disturbance, as these affect development, adjustment, and family resources. The service system will be analyzed with regard to health care, developmental support, education, residential options, and prevention.

MCH-BEH 210ab. An Introduction to Personality and Cognitive Development

Lectures, seminars. *One 2-hour session each week. 2.5 units.* Dr. Walker.

The basic principles of child growth and development in the cognitive and the psychosocial domains are examined in this introductory course. Special emphasis is placed on understanding the theories and research of Piaget, Freud, Erikson, and others, as well as the implications of these contributions to the planning and implementation of health and/or related social and educational services for children and youth.

MCH 211c. Health Care of Women

Seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Gardner.

Considers critical issues of health care and the common problems of women, including the changing role of women in contemporary US society. These health problems are addressed in terms of their epidemiology and the impact of technology on their detection and treatment viewed from biological, medical, behavioral, and legal perspectives.

MCH 213d. Obstetric Epidemiology

Lectures, seminars. *One 2-hour session each week. 1.25 units.* Dr. Sachs.

Tackles controversial issues in maternal health through techniques in epidemiology applied to obstetrics. Focuses on maternal mortality, obstetric and gynecologic morbidity, evaluation of obstetric health care, and populations at risk, such as pregnancies in women over 35. Examines the epidemiology of prematurity and current issues such as breast feeding, home births, Caesarian sections, and fetal monitoring.

MCH 222c. Social Services for Children, Adolescents, and Families

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Deykin.

Presents the crucial role of social services in maintaining and promoting the health of children and their families. Beginning with a historical overview of social services in the US, the course examines current political trends which structure the content and delivery of social services, drawing comparisons with those in other countries. The social and psychological determinants of the need for social services will focus on events of public health relevance, including terminal illness in childhood, adoption/foster care, family violence, substance abuse, and pregnancy in adolescence.

MCH-EPI 223b. Childhood Mental Disorders: Public Health Perspectives

Lectures, seminars. *Two 2-hour sessions per week. 2.5 units.* Dr. Deykin, Dr. Rauh. Examines the occurrence and known risk factors of selected mental disorders of childhood and adolescence, including autism, depression, hyperactivity, and anorexia. Emphasizes the methodologic issues of case definition, disorder classification, current diagnostic and screening instruments, and the advantages/disadvantages of available data sources. Readings will include studies selected to illustrate methodologic options and usefulness for public health policy.

HPM-MCH 252ab. Public Health Law and Human Rights

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Mariner. (Course described under Health Policy and Management.)

MCH 300abcd. Tutorials

Time and credit to be arranged.

Students at the master's level may arrange to work individually or in small groups under the guidance of a faculty member. The work may include participation in departmental research, specialized readings, field projects in a local or state health agency, or small studies to examine more in-depth topics introduced in various courses such as planning and evaluation of MCH services for children with handicapping conditions.

Tutorials will be offered depending on students' interests and will be limited by the amount of faculty time that is available. Arrangements must be made with individual faculty members.

MCH 330. Field Study

Field study will be arranged on an individual basis to meet the special needs of each student insofar as possible.

Additional Field Study

Students who lack sufficient previous experience are encouraged to undertake a period of field study before registration or after completion of the academic year in a program arranged by the staff of the department. No credit is allowed for such field study.

MCH 350. Research

Doctoral students are required to undertake research in maternal and child health.

The following course, offered by the Medical School, may be of particular interest to students of maternal and child health. It is open to qualified students from the School of Public Health.

HMS 705/40. The Clinical Care of the Aged Person: An Interdisciplinary Perspective

Half course (*spring term*). *Th., 3:00-5:30.* Satin.

Prereq. Permission of instructor; intent to work with the aged and aging issues; clinicians and non-clinicians accepted.

■ **NUTRITION**

NUT 201ab. Principles of Nutrition

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Franceschi.

Outlines current knowledge of the relationship between diet and human health and provides an introduction to the function of the various elements of nutrition. Consideration is also given to how nutrients may relate to such problems as cancer and heart disease.

NUT 202c. Nutrition Policy and Management

Two 1½-hour sessions each week. 2.5 units. Dr. Herrera-Acena, Dr. Overholt.

Uses the case study approach to examine the design, planning, and implementation of food and nutrition policies, as well as the design and management of specific nutrition programs. Course content focuses on these major topics, programming for vulnerable population groups, food fortification and new foods, marketing and nutrition education, and national policies and strategies.

Prereq. NUT 201ab or NUT 210ab recommended.

NUT 204ab/204cd. Departmental Seminars

Seminars. *Two 1-hour sessions each week. 2.5 units each term.* Dr. Owen, Members of the Department.

Students participate in and present seminars reviewing current research and publications related to nutrition in addition to attending advanced seminars presented by faculty and guest speakers. Beginning students learn skills required for oral presentations. Topics include both basic research and applied areas of nutrition.

NUT 205cd. Biochemistry and Physiology of Nutrition

To be given 1986-87; offered alternate years.

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Franceschi, Members of the Department.

The biochemistry and physiology of carbohydrates, fat, protein, vitamins, and minerals are integrated from the nutritional perspective. Course provides an in-depth analysis for students with a major interest in nutritional biochemistry.

Prereq. Course in biochemistry and permission of the instructors.

MCH-NUT 207cd. Nutrition in Child Growth and Development

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Dwyer.

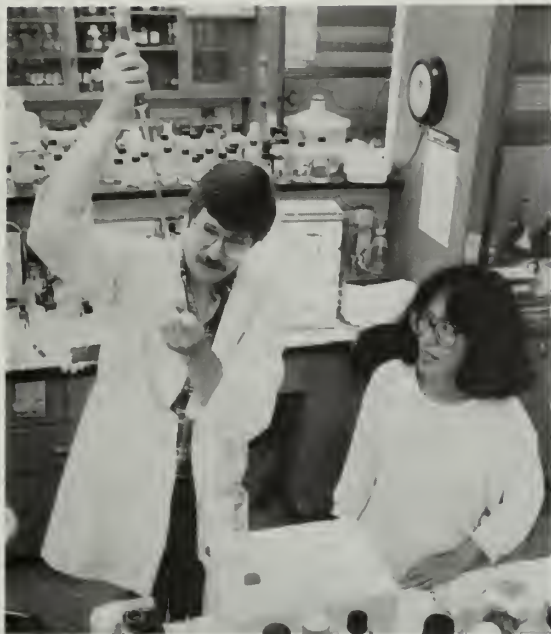
(Course described under Maternal and Child Health.)

NUT 208cd. Nutritional Aspects of Human Disease

Lectures, case presentations, discussions. *One 2-hour session each week. 2.5 units.*

Dr. Herrera-Acena, Mrs. Witschi.

Reviews the role of diet in the causation and management of clinical obesity, dia-



Dr. Hei Sook Sul, right, Assistant Professor of Biochemistry in the Department of Nutrition, works in the laboratory with her assistant, Research Fellow Dr. Joe Gauss.

betes mellitus, coronary artery disease, anemia, liver disease, alcoholism, gastrointestinal disorders, and renal disease. Early detection and prevention of these nutrition-related disorders are considered.

NUT 209ab. Food Science and Nutrition
Lectures, discussions. *Two 1-hour sessions each week. 2.5 units.* Mrs. Witschi, Dr. Samonds, Members of the Department.

Deals with nutrition in terms of the foods which supply mankind's nutrient needs, their composition and physical properties, and the positive and negative effects on nutrient qualities of food of genetic manipulation, agricultural practice, processing, storage, and cooking. The historical development of food technology, including methods of preservation and sanitation, is related to current methods employed in both developing and industrialized countries.

NUT 210ab. Nutrition Problems of Less-Developed Countries

Lectures, discussions. *One 2-hour session each week. 2.5 units.* Dr. Herrera-Acena. The nutrition problems of less-developed countries are discussed in the context of basic human needs. The ecology and the biological and behavioral consequences of malnutrition are reviewed in detail. Special emphasis on issues in human biology relevant to the formulation of nutrition policy and programs.

NUT 214ab/214cd. Research Techniques in Nutritional Biochemistry

Lectures. *One 1-hour session each week. Laboratory. Fifteen hours minimum each week. 5 units each term.* Dr. Geyer, Members of the Program in Nutritional Biochemistry. Students rotate through the laboratories (one each period) of faculty members in the

Nutritional Biochemistry Program in order to learn current techniques applied to nutritional, cellular, and biochemical research. Weekly lectures emphasize the theory behind the instrumentation utilized in the laboratory. Oral and written presentations of research accomplished by the student to the Nutrition faculty as required. Generally limited to students in the Department of Nutrition.

NUT-EPI 216ab. Nutritional Epidemiology

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Willett, Mrs. Witschi. Reviews methods for assessing dietary intakes of populations and individuals. Students will gain experience in the actual collection, analysis (including conversion to nutrients by computer), and interpretation of dietary intakes. Case studies follow, involving specific diet disease relationships integrating information from international studies, secular trends, clinical trials, analytical epidemiology, and animal experiments. Prereq. BIO 200ab or BIO 201ab, EPI 201a, and permission of the instructor for students who have not taken a course in nutrition.

NUT 217cd. Neural and Behavioral Factors in Cardiovascular Disease

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Verrier. The problem of cardiovascular disease is discussed in the context of contemporary research in nutrition, neuropharmacology, and applied physiology. The course will be based on material from textbooks and original papers. Emphasis will be placed on the potential clinical applications of this multidisciplinary approach. Prereq. Courses in biochemistry and physiology and permission of the instructor.

NUT 300abcde. Tutorial Programs

Time and credit to be arranged. Individual work under direction may be arranged. This can include laboratory studies, projects in applied nutrition, or library research.

NUT 351-368. Research

Time and credit to be arranged.

Facilities are available for doctoral students to do advanced work in nutrition along the lines of fundamental or applied research as related to public health and medicine. Areas currently receiving intensive and comprehensive study in the department are as follows:

- 351 Dr. Geyer.
Effects of growth factors and hormones on the metabolism of human cells in culture; nutrition and metabolism of isolated organs; complete blood replacement *in vivo* with artificial preparations.
- 352 Dr. Goldman.
The metabolism of food constituents and drugs, particularly as carried out by intestinal bacteria. Emphasis given to areas of metabolism that may help to understand a compound's biological activity.
- 353 Dr. Lown.
Coronary artery disease; etiology of sudden death; derangements of the heart beat; exercise physiology; electrolyte metabolism.
- 356 Dr. Antoniadis.
Regulation of cell growth by hormonal growth factors derived from human serum or platelets; platelet-derived growth factor and atherogenesis; mechanisms of hormone transport and regulation.
- 358 Dr. Herrera-Acena.
The role of nutrition and other environmental factors in the etiology and management of diabetes mellitus; the relationship of malnutrition to physical and cognitive development.
- 362 Dr. Verrier.
Influence of neural factors, psychologic conditioning, and myocardial ischemia on susceptibility to ventricular arrhythmias and sudden death.
- 363 Mrs. Witschi.
Computer-based interactive dietary history, analysis, and counseling programs.
- 364 Dr. Reinhold.
Structural characterization of glycoconjugates on biosurfaces by high performance liquid chromatography, gas chromatography and mass spectrometry.
- 366 Dr. Franceschi.
Regulation of cancer cell growth and differentiation by nutritional factors with emphasis on calcium and vitamin D, control of calcium transport, and gene expression by 1,25-dihydroxy-vitamin D₃.

- 368 Dr. Owen.
Hormonal regulation of nutrient uptake and membrane function in human cells. Mechanism of action of growth factors. Regulation of amino acid transport and protein synthesis.
- 369 Dr. Sul.
Regulation of lipogenic and glycolytic enzymes by hormonal and nutritional factors and alteration of this regulation in the diabetic state.
- 370 Dr. Storch.
Regulation of lipid transport and membrane composition.

Admission limited and subject to approval of the instructor.

■ POPULATION SCIENCES

POP 191ab. The Spatial Order of Societies (Sociology 191)

Lectures. *Two 1-hour sessions each week. 5 units.* Dr. Alonso.

Stresses the interaction of societies and their geography, focusing primarily on the historic and current development of the United States. Considers technology, institutions, ideology, health, the economy, and other factors.

POP 200ab. Introduction to Population Sciences

Lectures. *One 2-hour session each week. 2.5 units.* Professors Bell, Potter, and Members of the Department.

Reviews the basic elements of population change—fertility, mortality, and migration—and their interaction with social, cultural, and economic characteristics of societies for both developed and developing countries. Introduces basic demographic concepts and methods, including life tables and demographic rates.

POP 201ab. Community Foundations of Population Dynamics

Seminars. *One 2-hour session each week. 2.5 units.* Dr. Harkness, Dr. Wyon.

Supplements the introduction to population sciences presented in POP 200ab. Through in-depth study of several defined human communities, students learn how to trace immediate and underlying causes of rates of birth, death, and migration with inferences for the goals of public health and population policies and programs. Short papers are required.

POP 202cd. Student Project Design Seminar

Seminars. *One 2-hour session each week. 2.5 units.* Dr. Wyon, Dr. Harkness.

Oriented toward health and population problems of communities. Each student selects a community and an appropriate health or population problem. He/she presents a critical survey of the relevant literature and a project design, to amplify understanding of the relative frequency of the selected problem in relation to other health or population problems of the community, and to increase or test the available knowledge of causes of the problem.

Prereq. Pop 217b; introductory courses in biostatistics and epidemiology. Enrollment after interview with the instructor.

POP 204cd. Biological Basis for Fertility Control

Lectures. *Three 1-hour sessions each week. 5 units.* Dr. Salhanick, Dr. Seeley, Dr. Wolfson.

Presents the fundamental physiology and biochemistry relevant to known and potential methods of family planning. Topics include the biosynthesis, secretion, and effects of actions of the gonadal, gonadotropic, and hypothalamic hormones, the relationship of the natural steroid hor-

mones to synthetic analogues, and regulation of the menstrual cycle. A short paper or presentation may be required. Prereq. Appropriate science background or permission of the instructor.

POP 205ab. Introduction to Demographic Analysis

Lectures, discussions. *Two 2-hour sessions each week. 5 units.* Dr. Potter.

Reviews fundamentals of the measurement and analysis of mortality, nuptiality, fertility, migration, population growth, and age structure. Topics include sources of demographic data, demographic rates, cohorts and periods, model life tables and models of nuptiality and fertility, stable population theory, and population projections. Students will have the opportunity to analyze the demographic future of selected countries such as the United States, Mexico, and China.

POP 206cd. Demographic Methods for Developing Countries

Seminars. *Two 2-hour sessions each week. 5 units.* Dr. Larson.

Reviews methods for estimation and analysis of mortality and fertility rates from limited and faulty data obtained from censuses, surveys, maternity histories, and vital registration systems. Topics include estimation of infant, child, and adult mortality; age- and duration-specific fertility rates; and determinants of birth intervals. Students participate in discussions of recent literature about levels and trends in demographic rates. A short paper and presentation are required.

Prereq. An introductory course in population.

POP 207ab. Social Science Approaches to Population Change

Lectures. *Two 2-hour sessions each week. 5 units.* Dr. Potter, Dr. Mertens.

Reviews major contributions and debates in the social sciences with respect to theories of population change and causes of fertility, mortality, and migration. Focuses both on historical European experience and on societies in the contemporary developing world.

Short papers are required.

POP 208d. Demographic Surveys and Their Analysis

Seminars. *Two 2-hour sessions. 2.5 units.* Dr. Potter.

Introduces the wealth of demographic surveys available for developing countries and for the United States, and reviews procedures and techniques for analyzing these data. Topics include basic SAS procedures for manipulating survey data, calculating demographic rates and probabilities, life table analysis, cross-tabulations and regression, and hazards models. Emphasizes gaining practical experience in the analysis of survey data on mortality, fertility, marital formation and dissolution, birth intervals, breastfeeding, and contraceptive use.

Prereq. POP 200ab and BIO 202cd or equivalent (concurrent enrollment in latter is acceptable). Enrollment is subject to the availability of computer time, with a limit of 15 students.

POP 209ab. Foundations of Agricultural Sciences (Biology 195)

Lectures, seminars. *Two 1½-hour sessions each week. 5 units.* Dr. Levins.

Examines patterns of world food production as they develop from the interaction of social and biological systems: evolution of agro-ecosystems, principles of plant growth and productivity, pests and diseases, ecology of farming systems, consequences of technical choices, issues of agricultural change, and research strategies.

Prereq. Course in biology or permission of the instructor.

POP 212cd. Economics of Population Growth (Economics 2040)

Lectures. *Two 1-hour sessions each week.* Laboratory. *One 1½-hour session each week. 5 units.* Dr. Leibenstein, Dr. Potter, Dr. Bloom.

Emphasizes effects of population growth on problems of underdeveloped countries. Examines the welfare economics of population control, relations between population growth and resources, age-structure effects on demographic and economic variables, economic determinants of fertility change, and the population obstacle to economic growth.

Prereq. POP 200ab and HPM 205ab or equivalent.

Note: This course is given in Cambridge.

POP 214cd. The Biological Determinants of Fecundity, Environmental Factors, and Population Growth

Lectures. *One 2-hour session each week. 2.5 units.* Dr. Frisch.

Emphasizes the direct effect of environmental factors such as nutrition and physical activity on female and male reproductive ability throughout the reproductive span. Topics include adolescent growth, age of menarche, effects of exercise on the menstrual cycle, male maturation, age-specific fertility, pregnancy wastage, lactational amenorrhea and the birth interval, and age of menopause. Also included are the basic physiology and endocrinology of human reproduction, the history of birth control, and the interaction of biological factors and social customs affecting population growth.

Prereq. Course in biology or permission of the instructor.

POP 215c. Teenage and Delayed Childbearing in Life-Cycle Perspective

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Potter, Dr. Gerominus.

Highlights the life-course approach to conceptualizing demographic issues. Examines the personal and social salience of cultural norms regulating the timing of fertility in the life-cycle, applying this theo-

retical orientation to population research and policy issues. Topics include teenage maternity, delayed childbearing, ethnographic methods, and policies to alter fertility timing. Reviews historical, cross-cultural, and sub-cultural examples. Students apply course concepts and methodologies to specific research or policy questions.

POP 216cd. Comparative Analysis of Public Policies in Developing Countries (KSG S-552, Government 2110)

Lectures, seminars, workshops. *One 2-hour session each week. 5 units.* Dr. John D. Montgomery (Professor of Public Administration, John F. Kennedy School of Government).

Examines patterns of policy making across cultures and issue areas, including interactions between policies and social contexts. Surveys Third World policies for dealing with such problems as population (fertility and migration), malnutrition, land reform, and management of large-scale irrigation systems. Applies the policy sciences approach to the formulation and implementation of large-scale programs of public intervention in social processes.

POP 217b. Introduction to Community Diagnosis of Birth and Death Rates in Developing Countries

Lectures, discussions. *Two 2-hour sessions each week. 2.5 units.* Dr. Wyon, Dr. Harkness.

Helps students distinguish within communities those kinds of persons at high risk of serious illness, death, and unwanted births. Uses data from studies at national and local levels to trace underlying causes of these events as the basis for designing feasible, effective, and simple preventive measures. Provides foundation for POP 202cd and for other health and population courses considering policies and programs. Provides instruction and practice in the design and methods of field data collection and analysis at an introductory level.

Prereq. Introductory courses in biostatistics, epidemiology, and (preferably) population sciences.

POP 220d. Human Ecology

Lectures, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Levins.

Provides a broad overview of the human ecosystem as it emerges out of, but is different from, pre-human ecology. Topics will be selected from biosphere processes, population interaction, agricultural systems, adaptation, ecological politics, and evolution. Also considers the role of knowledge and conscious planning as an aspect of human ecology and examines approaches toward the solution of ecological problems. Prereq. Assumes basic knowledge of biology.

POP-HPM 263c. Case Studies in Design and Management of Population and Community Health Programs

Case discussions, seminars. *Two 2-hour sessions each week. 2.5 units.* Dr. Wyon, Dr. Harkness.

A managerial perspective on the problems of developing and implementing population and primary health care programs in Third World nations. Problems are examined from the level of managers of clinics, community and national programs. Topics covered primarily through case studies based on family planning and primary health care programs, particularly at the community and regional levels.

POP 300abcd. Tutorial Programs

Time and credit to be arranged.

Students at the master's level may make arrangements for tutorial work and special reading on topics related to population problems. There may be an opportunity to consider the design of studies, programs, or analysis of data.

POP 330e/330f. Field Studies

Field Trip to Haiti

The objective of this field study is to provide exposure to the urban, rural, and development problems of a developing country. Students visit the homes of rural farmers to observe the living conditions of these families and their accessibility to health care facilities and programs. Students also see rural health centers, health surveillance teams, nutrition programs, and the headquarters of various health programs. What has been observed, how it relates to data previously collected, and what programs can be developed to improve the conditions are then discussed with the group's leaders and with local health planners. Students are required to give a talk to Haitian colleagues and to write a report. The field trip is held during the week between the fall and spring terms or the week between the two halves of the spring term; the week chosen will be at the discretion of the tour directors. Organized by Haitian graduates of the school and sponsored by the Department of Population Sciences. Students must sign up for the course with the department by October 15. The estimated 1986-87 cost is \$1,600, which includes air fare, accommodations, honorarium, and faculty time. Partial financing of the course is the responsibility of the student and should be arranged as early as possible in the academic year. Dr. Berggren.

Enrollment limited to 10 and subject to approval of the instructor.

POP 350-355. Research

Time and credit to be arranged.

Candidates for doctoral degrees may undertake research in the department or may integrate research in population sciences with a doctoral program in another department or at the Center for Population Studies.

Members of the department and of the Center for Population Studies are currently engaged in research in the following areas:

350 *Field Studies and Programs*

Dr. Wyon, Dr. Guerrero,

Dr. Berggren.

- 351 *Biomedicine and Reproductive Physiology*
Dr. Salhanick.
- 352 *Demography*
Dr. Potter.
- 353 *Population Ethics*
Dr. Dyck.
- 354 *Biological Determinants of Fertility*
Dr. Frisch.
- 355 *Complex Systems*
Dr. Levins.
- 356 *Migration and Development*
Dr. Stark.
- 357 *Population Policy*
Prof. Bell.

The following courses, offered by other faculties of Harvard University, are among those that may be of particular interest to students of population sciences. They are open to qualified students from the School of Public Health.

Ethics 2859. Seminar: Ethics in Medicine and Public Health

Half course (spring term). Hours to be arranged. Dyck.
Previous work in ethics, law, or medicine required.

Sociology 251. Seminar: Social Policy and Population Issues in the Developed Countries

Half course (spring term). M., 2-4. Alonso.

Sociology 272. Seminar: Models of Association and Movement

Half course (spring term). Th., 1-3. Alonso, Rytina.

■ TOXICOLOGY

TOX 204a. Introduction to Principles of Toxicology

Lectures, seminars. Two 2-hour sessions each week. 2.5 units. Credit will be given only upon successful completion of this course and ESP 233c. Dr. Rice, Members of the Laboratory.

This course is a prerequisite for ESP 233c, *Industrial Toxicology*, and may not be taken in isolation. The course content is identical to the first half of TOX 205ab, *Principles of Toxicology*.

Prereq. Organic chemistry and mammalian physiology.

TOX 205ab. Principles of Toxicology (HMS Pharm. 713., FAS Pharm. 218)

Lectures, seminars. Two 2-hour sessions each week. 5 units. Dr. Rice, Members of the Laboratory.

Emphasizes mechanisms of injury resulting from exposure to environmental chemicals at the molecular, cellular, organ, and organismal levels. Methods used to detect, evaluate, analyze, and alleviate the toxic effects of chemicals are discussed.

Prereq. Organic chemistry and mammalian physiology.

TOX 208ab/209cd. Seminar in Toxicology

Seminars. One 1-hour session each week. 1 unit each term. Dr. Samson, Members of the Laboratory.

Includes seminars, journal clubs, and discussions of topics in basic research and the current literature in toxicology.

Prereq. Background in toxicology or related fields and permission of the instructor.

TOX 210ab/211cd. Advanced Toxicology
Laboratory with discussions, seminars, and assigned readings as appropriate. To be arranged. 5 units. Dr. Tashjian, Members of the Laboratory.

Examines experimental methods of research in toxicology. Includes individual laboratory work.

Prereq. TOX 205ab or equivalent and permission of the instructor.

TOX 300abcd. Tutorial Programs

Time and credit to be arranged.

Dr. Tashjian, Members of the Laboratory. Opportunities are provided for tutorial work in molecular, cellular, biochemical, and environmental toxicology.

Prereq. Permission of the instructor.

TOX 350. Research

Doctoral candidates may undertake laboratory research in toxicology under the direction of a faculty member.

Drs. Tashjian, Eisenstadt, Ofner, Rice, Samson, Schonbrunn, and Toscano.



Assistant Professor of Toxicology Leona Samson looks at damage to chromosomes in human cells.

■ TROPICAL PUBLIC HEALTH

TPH 201a. Ecology, Epidemiology, and Control of Important Parasitic Diseases of Developing Areas

Lectures, seminars, demonstrations. *Two 1-hour sessions and one 2-hour session each week. 3 units.* Dr. David, Members of the Department, Guest Lecturers.

Provides an introduction to ecological and epidemiologic concepts basic to the control of infectious agents. Considers important parasitic diseases of particular significance in the developing areas of the world. Epidemiologic principles of vector-associated diseases are elucidated through study of entities such as malaria and schistosomiasis. Prior knowledge of the pathogenesis of disease produced by infectious agents is desirable.

TPH 202b. Epidemiology of Infectious Diseases of Public Health Importance in Developing Countries

Lectures, team meetings. *Two 2-hour sessions each week. 2.5 units.* Dr. Cash, Guest Lecturers.

The epidemiology of infectious diseases of public health importance in developing countries will be thoroughly reviewed. Emphasis will be placed on epidemiologic patterns of bacterial and viral diseases as they relate to different geographic and socioeconomic environments. Methods of disease surveillance, especially as they relate to prevention and control, will also be stressed. Case studies will be extensively used with student teams proposing solutions to the problems.

Enrollment limited to 40 and subject to approval of the instructor if students have no previous background in health care delivery.

TPH 203b. Mycobacterioses

Lectures. *One 2-hour session each week. 1.25 units.* Dr. Koch-Weser, Dr. Piessens, Dr. Patel, Dr. Boom, Guest Lecturers.

Covers the immunobiology of mycobacteria and worldwide epidemiology, clinical diagnosis, and treatment of tuberculosis, leprosy, and diseases caused by other mycobacteria. Also deals with laboratory diagnosis, BCG vaccination, chemoprophylaxis, prevention, and tuberculosis control in Massachusetts, the US, and other countries. Problem cases will be presented.

TPH 204c. Introduction to the Techniques of Investigation of Parasitic Infections

Lectures, laboratory, seminars. *Two 3-hour sessions each week. One 2-hour additional laboratory session each week, to be arranged. 5 units.* Dr. Pan.

Emphasizes basic laboratory methods for the study of parasitic diseases of public health importance. Provides exposure to theory and application of techniques essential to epidemiologic and laboratory investigation. Life cycles of several parasites maintained and examined with respect

to detection and quantification of infection, immunity, and control.

Enrollment limited to 15 and subject to approval of the instructor. Preference given to concentrators in tropical public health and cancer biology.

TPH 205c. Clinical and Pathologic Features of Tropical Diseases

Case presentations, clinico-pathologic conferences, demonstrations. *One 2-hour session each week. 1 unit.* Dr. Maguire (Assistant Professor, Harvard Medical School), Dr. Dammin, Dr. Franz von Lichtenberg (Professor of Pathology, Harvard Medical School), Members of the Department, Members of the Pathology Department.

Designed for students particularly interested in tropical medicine. Emphasis is on the clinico-pathologic aspects of tropical diseases. At each session, disease entities are introduced by presenting a clinical case, and pertinent clinical and pathologic features of the disease are then reviewed. Enrollment subject to approval of the instructors.

TPH 206d. Principles of Public Health Entomology

Lectures, laboratories, seminars, field trips. *One 3-hour session each week. 2.5 units.* Dr. Spielman, Dr. Ribeiro.

The manner in which arthropods transmit disease and the principles of vector control are discussed from ecological, physiological, and genetic points of view. Class sessions introduce concepts and techniques currently employed in controlling vector-borne disease. Weekend field trips provide an opportunity for students to apply skills acquired in the classroom.

Prereq. TPH 201a or suitable biology background and permission of the instructors.

TPH 207c. Principles of Vector Physiology

Lectures, discussions. *One 1-hour session and one 2-hour session each week. 1.25 units.* Dr. Ribeiro.

Presents the physiology of blood-sucking arthropods in a series of lectures and discussions. This course aims to provide the student with an interest in arthropod-borne diseases and a base of insect physiology that will enable a comprehensive view of the interaction between pathogen/vector at a biochemical/physiological level. Each session requires reading up to five papers in the literature and writing answers to problem sets.

Prereq. Background in biology and biochemistry and permission of the instructor.

TPH 208d. Current Problems in Schistosomiasis

Lectures and seminars. *One 2-hour session each week. 2 units.* Dr. Chernin, Members of the Department.

The problems posed by schistosomiasis as an expanding health hazard are presented in a series of lectures and seminars. Emphasis is given to the biology of snail vectors, to problems of assessment of sig-

nificance of the disease, and to the potentials of various approaches to control.

Prereq. TPH 201a or permission of the instructor.

TPH 210c. Current Problems in Malariology

Lectures, seminars. *One 2-hour session each week. 2 units.* Dr. Jungery, Dr. Spielman, Members of the Department.

Reviews the biology of the malaria parasite, emphasizing factors that particularly affect transmission and human morbidity and mortality. Introduces the principles of malariometry and the strategies for controlling malaria. Analyzes current control programs in seminar discussions.

Prereq. TPH 201a and permission of the instructors.

TPH 216cd. The Biology of Parasitism (HMS Imm. 721.0, FAS Imm. 214)

Lectures, discussions. *One 3-hour session each week. 2.5 units.* Dr. Wirth, Dr. David, Members of the Department, Guest Lecturers.

Covers aspects of the biology, immunology, and molecular biology of various protozoa and helminths. Includes discussion on the mechanism of immune evasion, mechanism of antigenic variation, and the biology and immunology of malaria, schistosomes, filariae, leishmania, amoeba, and trypanosomes. Each session requires reading three or four papers in the literature and writing answers to problem sets.

Prereq. Suitable course in basic immunology and biology and permission of the instructors.

TPH 300abcde. Tutorial Programs

Laboratory exercises. *Time and credit to be arranged.*

Individual work for candidates at the master's degree level may be carried out under supervision of a member of the department. Various parasites of medical importance are maintained and are available for studies on immunology, molecular biology, cell biology, biochemistry, and chemotherapy. Arrangements subject to approval of the instructor.

TPH 350. Research

Doctoral candidates or qualified full-time special students may undertake original investigations in the laboratory or in the field by arrangement with the chairman of the department.

Members of the department are currently engaged in the following areas of research:

Biology, host-parasite relationships, and control of protozoa and helminths

Population genetics, nutrition, and reproduction of medically important arthropods

Immunology of protozoa and helminths
Molecular biology of protozoa and helminths

Arthropod transmission of viral, protozoan, and helminthic agents

Cultivation in vitro of parasitic helminths and protozoa of medical importance

ADMINISTRATION AND OFFICERS OF INSTRUCTION AND RESEARCH

■ PRESIDENT AND FELLOWS OF HARVARD COLLEGE

(This board is commonly known as the Corporation.)

Derek Bok, AB, JD, AM, LLD, President

Roderick Martin MacDougall, AB, Treasurer of Harvard College

Charles Pence Slichter, AB, AM, PhD, Senior Fellow of Harvard College

Robert Gregg Stone, Jr., AB, Fellow of Harvard College

Andrew Heiskell, PhB, Fellow of Harvard College

Colman Mockler, Jr., AB, MBA, Fellow of Harvard College

Henry Rosovsky, AB, AM, PhD, LLd, LHD, Fellow of Harvard College

Robert Shenton, AB, MBA, PhD, Secretary to the Corporation



Harvey V. Fineberg, Dean of the Faculty of the School of Public Health, left, and Elkan R. Blout, Dean for Academic Affairs.

■ ADMINISTRATIVE OFFICERS OF THE SCHOOL OF PUBLIC HEALTH

Derek Bok, AB, JD, AM, LLD, President

Harvey Vernon Fineberg, AB, MD, MPP, PhD, Dean of the Faculty of Public Health

Elkan Rogers Blout, AB, PhD, AM (hon.), DSc (hon.), Dean for Academic Affairs

Kenneth Paul Barclay, AB, MBA, Dean for Administration

Howard Jules Levy, SB, SM, MBA, Associate Dean for Finance and Operations

Dade William Moeller, SB, SM, PhD, Associate Dean for Continuing Education

Ruth Heather Palmer, BA, MB, BCh., SM in Hyg., Associate Dean for Students

Ann Rosenthal Oliver, AB, EdM, MPH, Assistant Dean for Academic Administration and Affirmative Action Officer

Norman Henry Peterson, Assistant Dean for Administrative Services

Jay Andrew Winsten, AB, PhD, Assistant Dean for Public and Community Affairs

Margaret Catherine Salmon, SB, Assistant to the Dean for Faculty Administration

Hanna Machlup Hastings, AB, AM, EdM, Director of Student Affairs

Judith Eileen Hull, BMus, MMus, Registrar and Director of Admissions

Mary Lou Licwinko, AB, MHSA, Director of Professional Development

Rebecca Handler Lubens, AB, Director of Publications

Ronald L. Orcutt, AB, SM, Acting Director of the Health Sciences Computing Facility

Laura Markowitz Till, AB, EdM, Director of Financial Aid

C. Robin LeSueur, BA, BSW, MLS, Librarian, Francis A. Countway Library of Medicine

■ MEMBERS OF THE FACULTY

William Alonso, AB, MCP (Harvard University); PhD (University of Pennsylvania), Richard Saltonstall Professor of Population Policy (*Population Sciences*).

David Alan Amato, AB (Colgate University); SM, PhD (Cornell University), Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute*.

Mary Ochsenhirt Amdur, SB (University of Pittsburgh); PhD (Cornell University), Associate Professor of Toxicology (*Environmental Science and Physiology*); *Lecturer, Massachusetts Institute of Technology*.

James Robert Anderson, AB (State University of New York at Buffalo); PhD (University of Washington at Seattle), Associate Professor of Biostatistics.

Harry Nicholas Antoniadis, BS, PhD (Athens University, Greece), Professor of Biochemistry (*Nutrition*); *Senior Investigator, Blood Research Institute, Inc., Boston*.

John Christian Bailar, III, AB (University of Colorado); MD (Yale University); PhD (American University), Lecturer on Biostatistics; *Senior Science Adviser, U.S. Department of Health and Human Services*.

Robert Bruce Banzett, SB (Pennsylvania State University); PhD (University of California at Davis), Associate Professor of Physiology (*Environmental Science and Physiology*).

Kenneth Paul Barclay, AB (Tufts University); MBA (University of Massachusetts, Amherst), Member of the Faculty of Public Health and Dean for Administration.

Benjamin Ayer Barnes, SB (Harvard College); MD (Columbia Medical School), Lecturer on Health Policy and Management; *Associate Professor of Surgery, Harvard Medical School*.

Diana Barrett, AB (Sweet Briar College); SM (Boston University); MBA, DBA (Harvard University), Lecturer on Management (*Health Policy and Management*).

Colin Banks Begg, BSc, PhD (University of Glasgow), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute*.

David Elliott Bell, AB (Pomona College); AM, LLD (hon.) (Harvard University), Clarence James Gamble Professor of Population Sciences and International Health (*Population Sciences*) and Director of the Center for Population Studies.

Gretchen Mary Berggren, AB (Nebraska State College); MD (University of Nebraska); SM in Hyg (Harvard University), Lecturer on Population Sciences.

Elkan Rogers Blout, AB (Princeton University); PhD (Columbia University); AM (hon.) (Harvard University); DSc (hon.) (Loyola University), Member of the Faculty of Public Health and Dean for Academic Affairs; *Edward S. Harkness Professor of Biological Chemistry, Harvard Medical School*.

Peter Boyle, BS, PhD (University of Glasgow), Assistant Professor of Biostatistics and Epidemiology (on leave to December 31, 1986).

Joseph David Brain, AB (Taylor University); SM, SM in Hyg, SD in Hyg (Harvard University), Professor of Physiology (*Environmental Science and Physiology*).

Peter Braun, SB (Yale University); MD (Columbia University), Lecturer on Public Health (*Health Policy and Management*).

J. Larry Brown, AB (Anderson College); AM (University of California, Los Angeles); MSW, PhD (Brandeis University), Lecturer on Health Services (*Health Policy and Management*) and Director of the Community Health Improvement Program.

Jonathan Bernard Brown, SB (Portland State University); MPP, PhD (Harvard University), Assistant Professor of Public Policy in Health Planning (*Health Policy and Management*).

William Alfred Burgess, SB (Tufts University); SM (Harvard University), Associate Professor of Occupational Health Engineering (*Environmental Science and Physiology*); *Corporate Manager of Industrial Hygiene, Polaroid Corp.*

James Preston Butler, AB (Pomona College); AM, PhD (Harvard University), Associate Professor of Biomathematics (*Environmental Science and Physiology*) (on leave 1986–87).

John Cairns, MD, BA, BM, BCh, DM (Oxford University); AM (hon.) (Harvard University), Professor of Microbiology (*Cancer Biology*).

Richard Alan Cash, SB (University of Wisconsin); MD (New York University); MPH (The Johns Hopkins University), Director of the Office of International Health Programs and Lecturer on Tropical Public Health; *Institute Fellow, Harvard Institute for International Development*.

Lincoln Chih-ho Chen, AB (Princeton University); MD (Harvard University); MPH (The Johns Hopkins University), Taro Takemi Professor of International Health (*Health Policy and Management*) and Director of the Takemi Program in International Health.

Eli Chernin, SB (College of City of New York); AM (University of Michigan); SD (The Johns Hopkins University); AM (hon.) (Harvard University), Professor of Tropical Public Health.

Paul David Cleary, SB, SM, PhD (University of Wisconsin), Lecturer on Behavioral Sciences; *Assistant Professor of Social Medicine, Harvard Medical School*.

Allen Carrol Crocker, AB (Massachusetts Institute of Technology); MD (Harvard University), Lecturer on Maternal and Child Health; *Associate Professor of Pediatrics, Harvard Medical School*.

Allen Latham Cudworth, BEE (University of Alabama); MEE (Massachusetts Institute of Technology); SD in Hyg (Harvard University), Lecturer on Applied Acoustics and Environmental Health (*Environmental Science and Physiology*); *Vice President of Liberty Mutual Insurance Company and Director, Hopkinton Research Center*.

William John Curran, JD (Boston College); LLM, SM in Hyg (Harvard University), Frances Glessner Lee Professor of Legal Medicine in the Faculty of Medicine and the Faculty of Public Health (*Health Policy and Management and Maternal and Child Health*) (on leave from February, 1987).

John Rouben David, AB (College of the University of Chicago); MD (University of Chicago Medical School); AM (hon.) (Harvard University), John LaPorte Given Professor of Tropical Public Health; *Professor of Medicine, Harvard Medical School*.

Richard Dennis, SB (Northeastern University); SM (Harvard University), Associate Professor of Applied Environmental Health Engineering (*Environmental Science and Physiology*); *Director, Pollution Control Laboratory, G.C.A. Corporation, Bedford*.

Guy Blaudin de Thé, MD (University of Marseille); PhD (University of Paris), Lecturer on Microbiology (*Cancer Biology*); *Professor, Université Claude Bernard, France*.

Eva Yona Deykin, AB (Radcliffe College); SM (Simmons College); MPH, DrPH (Harvard University), Associate Professor of Social Work (*Maternal and Child Health*).

Jeffrey Mark Drazen, SB (Tufts University); MD (Harvard University), Associate Professor of Physiology (*Environmental Science and Physiology*); *Associate Professor of Medicine, Harvard Medical School*.

Margaret Elizabeth Drolette, AB (Radcliffe College); MPH, PhD (Harvard University), Professor of Biostatistics; Chief Coordinator of the Master of Public Health Program.

Johanna Todd Dwyer, SB (Cornell University); SM (University of Wisconsin); SM in Hyg, SD in Hyg (Harvard University), Lecturer on Maternal and Child Health Nutrition (*Maternal and Child Health*); *Professor of Medicine and Community Health and Director, Stern Nutrition Center, Tufts Medical Center*.

Arthur James Dyck, AB (Tabor College); AM (University of Kansas); PhD (Harvard University), Mary B. Saltonstall Professor of Population Ethics; *Member of the Faculty of the Harvard Divinity School*.

Ellen Aura Eisen, SB (University of Michigan); SM (Massachusetts Institute of Technology); SM in Bios, SD (Harvard University), Assistant Professor of Occupational Health (*Environmental Science and Physiology*).

Eric Eisenstadt, AB, PhD (Washington University), Associate Professor of Microbiology (*Cancer Biology and Toxicology*).

Myron Elmer Essex, SB (University of Rhode Island); DVM, SM (Michigan State University); PhD (University of California); AM (hon.) (Harvard University), Professor of Microbiology (*Cancer Biology*).

John Stephen Evans, BSE, SM (University of Michigan); SM in EnvH, SD in EnvH (Harvard University), Assistant Professor of Environmental Science (*Environmental Science and Physiology*).

Polly Feigl, AB, SB (University of Chicago); AM, PhD (University of Minnesota), Visiting Professor of Biostatistics; *Professor of Biostatistics, University of Washington (from January, 1987)*.

Henry Arthur Feldman, AB (Swarthmore College); AM, PhD (Harvard University), Associate Professor of Applied Mathematics (*Environmental Science and Physiology and Biostatistics*).

Penny Hollander Feldman, AB (Radcliffe College); AM, PhD (Harvard University), Lecturer on Political Science (*Health Policy and Management*).

Michael Lawrence Feldstein, BA, MMath (University of Waterloo); PhD (State University of New York at Buffalo), Associate Professor of Biostatistics.

Benjamin Greeley Ferris, Jr., AB, MD (Harvard University); DHC (hon.) (University of Bordeaux), Professor of Environmental Health and Safety (*Environmental Science and Physiology*); *Director of Environmental Health and Safety, University Health Services*.

Harvey Vernon Fineberg, AB, MD, MPP, PhD (Harvard University), Dean of the Faculty of Public Health and Professor of Health Policy and Management.

Dianne Madelyn Finkelstein, AB (University of California, Berkeley); AM (Wayne State University); PhD (University of Michigan), Assistant Professor of Biostatistics.

Renny Theodore Franceschi, SB (University of Vermont); PhD (Purdue University), Assistant Professor of Biochemistry (*Nutrition*).

Howard Stanley Frazier, PhB (University of Chicago); MD (Harvard University), Director of the Institute for Health Research and Member of the Faculty of Public Health (*Health Policy and Management*); *Professor of Medicine, Harvard Medical School*.

Rose Epstein Frisch, AB (Smith College); AM (Columbia University); PhD (University of Wisconsin), Associate Professor of Population Studies (*Population Sciences*).

Jane Gardner, SB, SM (Boston College); SM in MCH, SD in MCH (Harvard University), Assistant Professor of Maternal and Child Health.

Richard David Gelber, SB (Cornell University); SM (Stanford University); PhD (Cornell University), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute*.

Rebecca Sue Gelman, AB (University of Michigan); PhD (State University of New York at Buffalo), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute*.

Robert Pershing Geyer, SB, SM, PhD (University of Wisconsin); AM (hon.) (Harvard University), Professor of Nutrition.

Laurie Hollis Glimcher, AB (Radcliffe College); MD (Harvard University), Assistant Professor of Immunology (*Cancer Biology*); *Assistant Professor of Medicine, Harvard Medical School*.

Marsha Geier Goldfarb, AB (Pembroke College); AM, PhD (Northwestern University), Visiting Associate Professor of Economics (*Health Policy and Management*); *Associate Professor of Economics, University of Maryland (to January, 1987)*.

Peter Goldman, B Eng Phys (Cornell University); AM (Harvard University); MD (The Johns Hopkins University), Professor of Health Sciences in Nutrition and Director of the Division of Biological Sciences in Public Health; *Maxwell Finland Professor of Clinical Pharmacology, Harvard Medical School*.

Steven Lawrence Gortmaker, AB (University of Michigan); SM, PhD (University of Wisconsin), Associate Professor of Sociology (*Behavioral Sciences*).

John David Graham, AB (Wake Forest University); AM (Duke University); PhD (Carnegie-Mellon University), Assistant Professor of Policy and Decision Sciences (*Health Policy and Management*).

Robert James Gray, AB (Whitman College); SM, PhD (Oregon State University), Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute*.

Ian Alexander Greaves, BMedSc, MB, BS (Monash University, Australia), Associate Professor of Occupational Health (*Environmental Science and Physiology*).

Robert Arthur Greenes, AB (University of Michigan); MD, PhD (Harvard University), Member of the Faculty of Public Health (*Biostatistics*); *Associate Professor of Radiology, Harvard Medical School*.

Tamara K. Hareven, AB, (Hebrew University); AM (Cincinnati University); PhD (Ohio State University), Lecturer on Population Studies (*Population Sciences*); *Professor, Clark University*.

Donald Alfred Harn, Jr., AB, AM, (University of Northern Colorado); PhD (University of California), Assistant Professor of Tropical Public Health; *Assistant Professor of Medicine, Harvard Medical School*.

David Paul Harrington, AB (Tufts University); AM, PhD (University of Maryland), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute*.

Joseph John Harrington, BCE (Manhattan College); AM, PhD (Harvard University), Professor of Environmental Health Engineering (*Environmental Science and Physiology and Population Sciences*) in the Faculty of Public Health and Gordon McKay Professor of Environmental Engineering in the Faculty of Arts and Sciences (on leave to February, 1987).

William Alan Haseltine, AB (University of California); PhD (Harvard University), Associate Professor of Microbiology (*Cancer Biology*); *Associate Professor of Pathology, Harvard Medical School*.

John Hedley-Whyte, BA, MB, BChir, MA, MD (Cambridge University, England), Member of the Faculty of Public Health (*Health Policy and Management*); *David S. Sheridan Professor of Anaesthesia and Respiratory Therapy, Harvard Medical School*.

David Hemenway, AB (Harvard University); AM (University of Michigan); PhD (Harvard University), Lecturer on Political Economy (*Health Policy and Management*).

Albert Edwin Henn, SM (Michigan State University); MD (Wayne State University); MPH (Harvard University), Lecturer on Health Policy and Management; *Associate Director for Health Programs, Harvard Institute for International Development*.

Manuel Guillermo Herrera-Acena, AB, MD (Harvard University), Lecturer on Nutrition; *Research Associate, Harvard Institute for International Development*.

Regina Elbinger Herzlinger, SB (Massachusetts Institute of Technology); DBA (Harvard University), Member of the Faculty of Public Health (*Health Policy and Management*); *Nancy R. McPherson Professor of Business Administration, Harvard Business School*.

Howard Haym Hiatt, MD (Harvard University); ScD (hon.) (Northeastern University), Professor of Medicine in the Faculty of Medicine and the Faculty of Public Health (*Health Policy and Management*).

Donald Frederick Hornig, SB, PhD (Harvard University), Professor of Chemistry in Public Health (*Environmental Science and Physiology*); *Director of Interdisciplinary Programs in Health* (on leave from February, 1987).

William Ching-Lung Hsiao, AB (Ohio Wesleyan University); MPA, PhD (Harvard University), Professor of Health Systems Economics (*Health Policy and Management*); *Member of the Faculty of Harvard Business School*.

Chung-Cheng Hsieh, MPH (National Taiwan University); SM in Epi, SD (Harvard University), Assistant Professor of Epidemiology.

Anne Therese Hunt, SB (Lowell University); SM in Bios and Epid, SD (Harvard University), Assistant Professor of Biostatistics (on leave 1986–87).

George Barkley Hutchison, AB, MD, MPH (Harvard University), Professor of Epidemiology.

Roland Harrison Ingram, Jr., SB (University of Alabama); MD (Yale University), Member of the Faculty of Public Health (*Environmental Science and Physiology*); *Parker V. Francis Professor of Medicine, Harvard Medical School*.

Anthony Amade James, SB, PhD (University of California), Assistant Professor of Tropical Public Health.

Brent Carl James, SB, SB, MD, SM (University of Utah), Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute* (on leave to March, 1987).

Michele Jungery, SB, SM (University of Colorado); MPH, PhD (University of California), Assistant Professor of Tropical Public Health.

Nancy Morgan Kane, SB (Simmons College); MBA, DBA (Harvard University), Assistant Professor of Management (*Health Policy and Management*) (on leave 1986–87).

Jack Kasten, SB (Michigan State University); MPH (University of Michigan); JD (Boston College), Lecturer on Health Services Administration (*Health Policy and Management*); *Vice President, Arthur D. Little, Inc., Cambridge*.

Ann Randtke Kennedy, AB (Vassar College); SM in Env H, SD in Phys (Harvard University), Associate Professor of Radiobiology (*Cancer Biology*).

Matthew William Knuiman, BSc, PhD (University of Western Australia); Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute*.

Dieter Koch-Weser, MD (Faculty of Medicine, University of Sao Paulo, Brazil); SM, PhD (Northwestern University), Lecturer on Tropical Public Health.

Stephen William Lagakos, SB (Carnegie-Mellon University); MPhil, PhD (George Washington University), Professor of Biostatistics; *Dana-Farber Cancer Institute*.

Nan McKenzie Laird, SB (University of Georgia); PhD (Harvard University), Professor of Biostatistics.

Martin Graham Larson, AB, SM, SD in Bios (Harvard University), Assistant Professor of Biostatistics and Population Sciences; *Co-Director, Biometry Unit, Robert B. Brigham Multipurpose Arthritis Center.*

Alexander Leaf, SB (University of Washington); MD (University of Michigan Medical School); AM (Harvard University), Member of the Faculty of Public Health; *Ridley Watts Professor of Preventive Medicine and Clinical Epidemiology, Harvard Medical School.*

David Evan Leith, AB (Lehigh University); MD (Harvard University), Member of the Faculty of Public Health (*Environmental Science and Physiology*); *Associate Professor of Anaesthesia, Harvard Medical School.*

C. Robin LeSueur, BA, BSW (University of Toronto); MLS (Columbia University), Member of the Faculty of Public Health and the Faculty of Medicine; *Librarian of the Francis A. Countway Library of Medicine.*

Richard Levins, AB (Cornell University); PhD (Columbia University); AM (hon.) (Harvard University), John Rock Professor of Population Sciences.

Howard Jules Levy, SB, SM, MBA (Rensselaer Polytechnic Institute), Member of the Faculty of Public Health and Associate Dean for Finance and Operations.

Richard Charles Lewontin, AB (Harvard University); AM, PhD (Columbia University), Member of the Faculty of Public Health (*Population Sciences*); *Alexander Agassiz Professor of Zoology, Harvard University (on leave 1986–87).*

John Bertram Little, AB (Harvard University); MD (Boston University), Professor of Radiobiology (*Cancer Biology*) and Director of the Kresge Center for Environmental Health.

Stephen Hathaway Loring, AB (Amherst College); BMS (Dartmouth Medical School); MD (Harvard University), Associate Professor of Physiology (*Environmental Science and Physiology*) (on leave from January, 1987).

Thomas Arthur Louis, AB (Dartmouth College); PhD (Columbia University), Associate Professor of Biostatistics.

Bernard Lown, SB (University of Maine); MD (The Johns Hopkins University), Professor of Cardiology in Nutrition.

Kenneth Malcolm Maclure, BA (Oxford University), SM in Epid, SD (Harvard University), Assistant Professor of Epidemiology.

Brian MacMahon, MD, DPH, PhD (University of Birmingham, England); SM in Hyg (Harvard University), MD (hon.) (University of Athens), Henry Pickering Walcott Professor of Epidemiology (on leave from January, 1987).

Wendy Kathleen Mariner, AB (Wellesley College); JD (Columbia University); LLM (New York University); MPH (Harvard University), Assistant Professor of Health Law (*Health Policy and Management*).

Jere Mead, SB, MD (Harvard University), Cecil K. and Philip Drinker Professor of Environmental Physiology (*Environmental Science and Physiology*).

Cyrus Rustam Mehta, BTech (Indian Institute of Technology); SM, PhD (Massachusetts Institute of Technology), Associate Professor of Biostatistics; *Dana-Farber Cancer Institute.*

Charles Marie Joseph Mertens de Wilmars, MD, Lic en Psych (Catholic University of Louvain, Belgium), Visiting Professor of Psychiatry (*Behavioral Sciences*); *Professor of Medical Psychology, Faculty of Medicine, Catholic University of Louvain, Belgium.*

Dade William Moeller, SB, SM (Georgia Institute of Technology); PhD (North Carolina State College), Professor of Engineering in Environmental Health (*Environmental Science and Physiology*) and Associate Dean for Continuing Education.

Richard Redding Monson, SB (North Dakota State University); MD, SM in Hyg, SD in Hyg (Harvard University), Professor of Epidemiology and Director of the Educational Resource Center for Occupational Health and Safety.

C. Frederick Mosteller, SB, SM (Carnegie Institute of Technology); AM, PhD (Princeton University); SD (hon.) (Wesleyan University); SD (hon.) (University of Chicago); SD (hon.) (Carnegie-Mellon University); SSD (hon.) (Yale University), Roger Irving Lee Professor of Mathematical Statistics (*Health Policy and Management and Biostatistics*); *Professor of Mathematical Statistics in the Faculty of Arts and Sciences; Member of the Faculty of Medicine, Harvard Medical School.*

Nancy Elsa Mueller, AB (Beloit College); SM in Epid, SD in Epid (Harvard University), Associate Professor of Epidemiology.

James Ivan Mullins, AB (University of South Florida); PhD (University of Minnesota), Assistant Professor of Virology (*Cancer Biology*).

Jane M. Murphy, AB (Phillips University); PhD (Cornell University), Lecturer on Epidemiology; *Associate Professor of Anthropology, Harvard Medical School.*

Roger Loyd Nichols, AB (Cornell College); MD (University of Iowa); AM (hon.) (Harvard University), Professor of International Health (*Population Sciences*); *Director of the Boston Museum of Science.*

Peter Ofner, BSc (University of London); ARIC (Associate of Royal Institute of Chemistry of Great Britain and Northern Ireland); PhD (University of London), Lecturer on Toxicology; *Director, Steroid Biochemistry Laboratory, Shattuck Hospital.*

Ann Rosenthal Oliver, AB (Smith College); EdM (Harvard University); MPH (University of Hawaii), Member of the Faculty of Public Health and Assistant Dean for Academic Administration.

Endel John Orav, AB (Princeton University); PhD (Stanford University), Assistant Professor of Biostatistics.

Albert Joseph Owen, III, SB (University of Rhode Island); PhD (Harvard University), Assistant Professor of Biochemistry (*Nutrition*).

Marcello Pagano, BSc (University of Cape Town); SM (University of Florida); PhD (The Johns Hopkins University); AM (hon.) (Harvard University), Professor of Statistical Computing (*Biostatistics*).

Ruth Heather Palmer, BA, MB, BCh (Cambridge University, England); SM in Hyg (Harvard University), Lecturer on Health Services (*Health Policy and Management*) and Associate Dean for Students.

Steve Chia-Tung Pan, BS (Tokyo Jikeikai Premedical College); MD (Tokyo Jikeikai Medical College); MPH (Harvard University), Professor of Tropical Public Health.

Ganapati Parashuram Patil, BSc, MSc, (Poona University, India); SM, PhD (University of Michigan, Ann Arbor), Visiting Professor of Biostatistics; *Professor of Mathematical Statistics, Pennsylvania State University*.

Debra Ann Peattie, AB (Hollins College); PhD (Harvard University), Assistant Professor of Tropical Public Health.

Norman Henry Peterson, Member of the Faculty of Public Health and Assistant Dean for Administrative Services.

Chester Middlebrook Pierce, AB, MD (Harvard University), Professor of Education and Psychiatry in the Faculty of Medicine, the Graduate School of Education, and the Faculty of Public Health (*Behavioral Sciences*).

Willy Frans Piessens, BS (College te en van Melle, Belgium); MD (Free University of Brussels), Member of the Faculty of Public Health (*Tropical Public Health*); *Associate Professor of Medicine, Harvard Medical School*.

Peter Elliot Politser, BMS, MD (Northwestern University); AM, AM, PhD (University of Michigan), Associate Professor of Health Decision Sciences (*Health Policy and Management* and *Biostatistics*).

Joseph Earl Potter, AB (Yale University); MPA, PhD (Princeton University), Associate Professor of Demography (*Population Sciences*).

Michael Robin Reich, AB, AM, PhD (Yale University), Associate Professor of International Health (*Health Policy and Management*) and Executive Director of the Takemi Program in International Health.

Vernon Nye Reinhold, SB, SM (University of New Hampshire); PhD (University of Vermont), Lecturer on Biological Chemistry in the Faculty of Public Health (*Nutrition*) and the Faculty of Medicine.

Jose Marcos Chaves Ribeiro, MD (State University of Rio de Janeiro); PhD (Biophysics Institute, Rio de Janeiro), Assistant Professor of Tropical Public Health.

Robert Hafling Rice, SB (Massachusetts Institute of Technology); PhD (University of California), Associate Professor of Toxicology.

Julius Benjamin Richmond, SB, SM, MD (University of Illinois), Professor of Health Policy in the Faculty of Public Health (*Health Policy and Management* and *Maternal and Child Health*) and the Faculty of Medicine; *Director of the Harvard University Division of Health Policy Research and Education*.

Marc Jeffrey Roberts, AB, PhD (Harvard University), Professor of Political Economy (*Health Policy and Management*).

James Matthew Robins, MD (Washington University), Assistant Professor of Occupational Health and Biostatistics (*Environmental Science and Physiology* and *Biostatistics*).

Barbara Gutmann Rosenkrantz, AB (Radcliffe College); PhD (Clark University), Professor of the History of Science in the Faculty of Arts and Sciences and the Faculty of Public Health (*Health Policy and Management*).

Louise Marie Ryan, AB (Macquarie University); PhD (Harvard University), Assistant Professor of Biostatistics; *Dana-Farber Cancer Institute*.

Peter Barry Ryan, SB (University of Massachusetts); SM (University of Chicago); PhD (Wesleyan University), Assistant Professor of Environmental Health (*Environmental Science and Physiology*).

Benjamin Paul Sachs, MB, BS, MRCS, LRCP (St. Mary's Medical School, London University); DPH (University of Toronto), Assistant Professor of Obstetrics and Gynecology in the Faculty of Medicine and the Faculty of Public Health (*Maternal and Child Health*).

Hilton Aaron Salhanick, AB, AM, PhD (Harvard University); MD (University of Utah), Frederick Lee Hisaw Professor of Reproductive Physiology (*Population Sciences*); *Professor of Obstetrics and Gynecology, Harvard Medical School*.

Leona Dorothy Samson, BS (University of Aberdeen); PhD (University of London), Assistant Professor of Toxicology.

Alice Marie Sapienza, SB (Stonehill College); AM (Boston College); MBA, DBA (Harvard University), Assistant Professor of Management (*Health Policy and Management*) (on leave to February, 1987).

David Alan Schoenfeld, AB (Reed College); AM, PhD (University of Oregon), Associate Professor of Biostatistics in the Faculty of Medicine and the Faculty of Public Health.

Agnes Schonbrunn, BSc (McGill University); PhD (Brandeis University), Associate Professor of Toxicology.

Daniel Henry Seeley, SB (Massachusetts Institute of Technology); AM, PhD (Boston University), Member of the Faculty of Public Health (*Population Sciences*); *Assistant Professor of Obstetrics and Gynecology, Harvard Medical School*.

Jacob Shapiro, SB (City College of New York); SM (Brown University); PhD (University of Rochester), Lecturer on Biophysics in Environmental Health (*Environmental Science and Physiology*); *Radiological Health and Safety Engineer to the University Health Services*.

Donald Sloane Shepard, AB, MPP, PhD (Harvard University), Associate Professor of Operations Management and Operations Research (*Health Policy and Management*); *Research Associate, Harvard Institute for International Development and Director of Economic Research, West Roxbury Veteran's Administration Medical Center*.

Stover Hoffman Snook, AB (Hartwick College); AM (Fordham University); PhD (Tufts University), Lecturer on Ergonomics (*Environmental Science and Physiology*); *Project Director, Liberty Mutual Insurance Company*.

Frank Erwin Speizer, AB, MD (Stanford University), Professor of Environmental Science (*Environmental Science and Physiology*); *Professor of Medicine, Harvard Medical School*.

John Daniel Spengler, SB (University of Notre Dame); PhD (State University of New York at Albany); SM in EnvH (Harvard University), Professor of Environmental Health (*Environmental Science and Physiology*).

Andrew Spielman, SB (Colorado College); SD (The Johns Hopkins University), Professor of Tropical Public Health.

Oded Stark, BA, BA (Hebrew University of Jerusalem); PhD (University of Sussex), Lecturer on Economics and Population (*Population Sciences*) and Senior Lecturer, Economics, Bar-Ilan University, Israel.

Judith Storch, AB (Brooklyn College); SM, PhD (Columbia University), Assistant Professor of Nutrition.

Hei Sook Sul, BS (Ewha University, Korea); SM, PhD (University of Wisconsin), Assistant Professor of Biochemistry (*Nutrition*).

Armen Haig Tashjian, Jr., MD (Harvard University), Professor of Toxicology; Professor of Pharmacology, Harvard Medical School.

Stephen Richard Thomas, AB (Oberlin College); AM, PhD (Harvard University), Assistant Professor of Political Science and Environmental Policy (*Health Policy and Management*).

William Augustine Toscano, SB, SM (Indiana University); PhD (University of Illinois), Associate Professor of Toxicology.

Anastasios Athanasios Tsiatis, SB (Massachusetts Institute of Technology); PhD (University of California), Associate Professor of Biostatistics; Dana-Farber Cancer Institute.

Ming Tso Tsuang, MD (National Taiwan University); PhD, DSc (hon.) (University of London); AM (hon.) (Brown University), Member of the Faculty of Public Health (*Epidemiology*); Professor of Psychiatry, Harvard Medical School.

Isabelle Valadian, MD (Faculte Française de Medicine, Beirut, Lebanon); MPH (Harvard University), Professor of Maternal and Child Health.

Peter Alexander Valberg, AB (Taylor University); AM, SM, PhD (Harvard University), Associate Professor of Physiology (*Environmental Science and Physiology*).

Richard Leonard Verrier, AB (University of New Hampshire); PhD (University of Virginia), Associate Professor of Physiology (*Nutrition*).

Warren Ernest Clyde Wacker, MD (George Washington University); AM (hon.) (Harvard University), Member of the Faculty of Public Health; Henry K. Oliver Professor of Hygiene; Director of University Health Services.

Alexander Muir Walker, AB, MPH, MD, DrPH (Harvard University), Associate Professor of Epidemiology.

Deborah Klein Walker, AB (Mt. Holyoke College); EdM, EdD (Harvard University), Associate Professor of Human Development (*Behavioral Sciences and Maternal and Child Health*).

James Hutchinson Ware, AB (Yale University); PhD (Stanford University), Professor of Biostatistics.

Henry Wechsler, AB (Washington and Jefferson College); AM, PhD (Harvard University), Lecturer on Social Psychology (*Behavioral Sciences*); Research Director, The Medical Foundation, Inc.

Milton Charles Weinstein, AB, AM, MPP, PhD (Harvard University), Henry J. Kaiser Professor of Health Policy and Management (*Health Policy and Management and Biostatistics*) (on leave 1986–87).

Walter Churchill Willett, MD (University of Michigan); MPH, DrPH (Harvard University), Associate Professor of Epidemiology.

Dyann Fergus Wirth, AB (University of Wisconsin at Madison); PhD (Massachusetts Institute of Technology), Associate Professor of Tropical Public Health.

Jelia Cox Witschi, SB (West Virginia University); SM (Case Western University), Lecturer on Nutrition.

Adele Judith Wolfson, AB (Brandeis University); AM, MPhil, PhD (Columbia University), Member of the Faculty of Public Health (*Population Sciences*); Assistant Professor of Obstetrics and Gynecology, Harvard Medical School (on leave 1986–87).

John Benjamin Wyon, BA, MB, BCh (Cambridge University); MPH (Harvard University), Senior Lecturer on Population Studies (*Population Sciences*).

Yukio Yanagisawa, BEng, MEng, DEng (University of Tokyo), Assistant Professor of Environmental Health (*Environmental Science and Physiology*).

Marvin Zelen, SB (City College of New York); AM (University of North Carolina); PhD (American University); AM (hon.) (Harvard University), Professor of Statistical Science (*Biostatistics*); Member of the Faculty of Arts and Sciences; Director of Statistics Unit, Dana-Farber Cancer Institute.

■ PROFESSORS EMERITI

Paul Maximillian Densen, AB, SD, AM (hon.), Professor of Community Health, Emeritus (1980).

Melvin William First, SB, SM, SD, Professor of Environmental Health Engineering, Emeritus (1985).

Roy Orval Greep, SB, SM, PhD, AM (hon.), SD (hon.), John Rock Professor of Population Studies, Emeritus (1974).

David Mark Hegsted, SB, SM, PhD, AM (hon.), Professor of Nutrition, Emeritus (1980).

Nathan Keyfitz, BSc, PhD, Andelot Professor of Sociology in the Faculty of Arts and Sciences and of Demography in the Faculty of Public Health, Emeritus (1983).

Alexander Hamilton Leighton, AB, AM, MD, AM (hon.), Professor of Social Psychiatry, Emeritus (1975).

Robert Balentine Reed, AB, AM, PhD, AM (hon.), Professor of Biostatistics, Emeritus (1982).

Roger Randall Dougan Revelle, AB, PhD, SD (hon.), AM (hon.), LHD, LLD, Richard Saltonstall Professor of Population Policy, Emeritus (1978).

Elizabeth Prince Rice, AB, SM, Associate Professor of Public Health and Social Work, Emerita (1967).

William Morris Schmidt, SB, MD, AM (hon.), Professor of Maternal and Child Health, Emeritus (1973).

John Crayton Snyder, AB, MD, LLD, Professor of Population and Public Health, Emeritus (1976).

Fredrick John Stare, SB, SM, PhD, MD, AM (hon.), SD (hon.), DSc (hon.), Professor of Nutrition, Emeritus (1980).

Thomas Huckle Weller, AB, SM, MD, LLD (hon.), Richard Pearson Strong Professor of Tropical Public Health, Emeritus (1985).

James Laverre Whittenberger, SB, MD, AM (hon.), James Stevens Simmons Professor of Public Health; Professor of Physiology, Emeritus (1982).

Jane Worcester, AB, DrPH, SD (hon.), Professor of Biostatistics and Epidemiology, Emerita (1977).

Alonzo Smythe Yerby, SB, MD, MPH, Professor of Health Services Administration, Emeritus (1982).

■ TEACHING AND RESEARCH STAFF

Walter Pierce Allen, MBA, Visiting Lecturer on Health Services (*Health Policy and Management*).

Keaven Martin Anderson, PhD, Visiting Lecturer on Biostatistics.

Wendell Lowrie Anderson, SB, Visiting Lecturer on Nuclear Air Cleaning (*Environmental Science and Physiology*).

Alexia Anne Antczak, DMD, DrPH, Instructor in Dental Public Health (*Health Policy and Management*).

Sona Aratan-Spire, DSc, Visiting Scientist in Toxicology.

Jorge Ramon Arias, PhD, Visiting Lecturer on Tropical Public Health.

Kenneth Alfred Arndt, MD, Lecturer on Occupational Dermatology (*Environmental Science and Physiology*).

Carolyn Westbrook Arnold, MSW, SD in HSAd, Visiting Research Associate in Maternal and Child Health.

Nicholas Askounes Ashford, PhD, JD, Visiting Lecturer on Occupational Health Policy (*Environmental Science and Physiology*).

Elisha Hornblower Atkins, MD, SM in Phys, Instructor in Occupational Medicine (*Environmental Science and Physiology*).

Antoine Augustin, MD, MPH, Visiting Lecturer on Population Sciences.

Lynne Margaret Ausman, SD in Nutr, Research Associate in Nutrition.

Tamara Eugenia Awerbuch, PhD, Research Associate and Lecturer on Biostatistics.

Susan Pardee Baker, MPH, Visiting Lecturer on Injury Prevention (*Environmental Science and Physiology*).

Kay Walker Bander, SM in HSAd, Visiting Lecturer on Health Services Administration (*Health Policy and Management*).

John Alan Barmack, MBA, Lecturer on Occupational Health Management (*Environmental Science and Physiology*).

Brenda Elizabeth Barry, PhD, Research Associate in Respiratory Biology (*Environmental Science and Physiology*).

Lester Carl Bartholow, SD in Nutr, Visiting Research Associate in Nutrition.

Barbara Doris Beck, PhD, Visiting Lecturer on Respiratory Biology (*Environmental Science and Physiology*).

Ronald Roy Bellamy, PhD, Visiting Lecturer on Radiological Health (*Environmental Science and Physiology*).

Robert Charles Benfari, MBA, PhD, SM in Hyg, Lecturer on Psychology (*Behavioral Sciences*).

Susan Elizabeth Bennett, MD, Research Associate in Clinical Decision Making (*Institute for Health Research*).

Judith Dolin Bentkover, PhD, Lecturer on Economics (*Health Policy and Management*).

Arthur Angelo Berarducci, MPH, Lecturer on Health Services Administration (*Health Policy and Management*).

Warren Lee Berggren, MD, DrPH, Visiting Lecturer on Tropical Public Health.

Donald Mark Berwick, MD, MPP, Lecturer on Health Services (*Health Policy and Management*).

Paul Cushwa Billings, PhD, Research Associate in Radiobiology (*Cancer Biology*).

Laurence Herbert Bishoff, SB, Visiting Lecturer on Health Services (*Health Policy and Management*).

Charles Myron Blatt, MD, Research Associate in Cardiology (*Nutrition*).

Kenneth Dale Bloem, SM in HPM, Visiting Lecturer on Health Services (*Health Policy and Management*).

David Blumenthal, MD, MPP, Lecturer on Health Services (*Health Policy and Management*).

Leslie Irvin Boden, PhD, Lecturer on Occupational Health (*Environmental Science and Physiology*).

John Dunning Boice, Jr., SD in Epid, Visiting Lecturer on Epidemiology.

Thomas John Bossert, PhD, Visiting Lecturer on International Health (*Health Policy and Management*).

Markley Holmes Boyer, MD, DPhil, MPH, Visiting Lecturer on Tropical Public Health.

Thomas Ball Bracken, LLB, Visiting Lecturer on Community Air Pollution (*Environmental Science and Physiology*).

Alfred Andreas Buck, MD, MPH, ScD, Visiting Lecturer on Tropical Public Health.

Stanley Gene Burchfield, MBA, MPH, Visiting Lecturer on Health Services (*Health Policy and Management*).

Ruth Margaret Butler, SM, Research Associate in Social Work (*Maternal and Child Health*).

Sheldon Daniel Bycoff, MBA, Visiting Lecturer on Health Services (*Health Policy and Management*).

David Ross Calkins, MD, MPP, Instructor in Health Policy and Management.

Debra Lynn Caplan, MPA, Visiting Lecturer on Health Policy and Management.

Juan Emilio Carrillo, MD, MPH, Instructor in Health Policy (*Health Policy and Management*).

Jean-Paul J. Chaine, DrPH, Visiting Lecturer on International Health (*Health Policy and Management*).

Lilian Wai-Yin Cheung, SD in Nutr, Lecturer on Nutrition.

David Christopher Christiani, MD, MPH, SM in Phys, Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

Shu-heh Wang Chu, PhD, Research Associate in Nutrition.

Vincent Matthew Ciriello, DSc, Visiting Lecturer on Biomechanics (*Environmental Science and Physiology*).

Avital Cnaan, PhD, Visiting Lecturer on Biostatistics.

Shepard Nathan Cohen, MPA, Visiting Lecturer on Health Services (*Health Policy and Management*).

Philip Timothy Cole, MD, DrPH, Visiting Lecturer on Epidemiology.

Sarah Phyllis Combs, MPH, Lecturer on International Health (*Health Policy and Management*).

Earl Francis Cook, SD, Lecturer on Epidemiology.

John Paul Corley, SB, Visiting Lecturer on Environmental Radiation Surveillance (*Environmental Science and Physiology*).

Susan Mary Cotter, DVM, Visiting Lecturer on Cancer Biology.

Daniel William Cramer, MD, SD, Lecturer on Epidemiology.

Kathleen Ridder Crampton, MPH, Visiting Lecturer on Health Services (*Health Policy and Management*).

John Eustace Cupples, MTh, Visiting Lecturer on Health Services (*Health Policy and Management*).

Lawrence Hugh Daltroy, DrPH, Instructor in Behavioral Sciences.

Gustave John Dammin, MD, Lecturer on Tropical Public Health.

Letitia Katherine Davis, EdM, SD, Research Associate in Occupational Health (*Environmental Science and Physiology*).

Roger Stephen Day, SD, Lecturer on Biostatistics.

Maureen Chambers DeFuria, SM in HPM, Visiting Lecturer on Health Policy and Management.

Carole Ruth Dichter, SD, Lecturer on Nutrition.

Douglas William Dockery, SD in EnvH, Research Associate in Environmental Health (*Environmental Science and Physiology*).

Chester William Douglass, DDS, MPH, PhD, Lecturer on Public Health Dentistry (*Health Policy and Management*).

David Dressler, PhD, Lecturer on Microbiology (*Cancer Biology*).

Karin Arntz Dumbaugh, AM, SM in HSAd, SD, Lecturer on Health Services (*Health Policy and Management*).

William Hermans DuMouchel, PhD, Lecturer on Biostatistics.

Bruce Anthony Egan, SM in ME, SD in EnvH, Visiting Lecturer on Air Pollution Meteorology (*Environmental Science and Physiology*).

Manning Feinleib, MD, DrPH, Visiting Lecturer on Epidemiology.

Robert George Feldman, MD, Lecturer on Neurology (*Environmental Science and Physiology*).

Mark George Field, PhD, Lecturer on Health Services Administration (*Health Policy and Management*).

William David Finkle, PhD, Visiting Lecturer on Epidemiology.

James Black Fischer, PhD, Research Associate in Toxicology.

William Herbert Foege, MD, MPH, Visiting Lecturer on Tropical Public Health.

Ann-Marie Foltz, PhD, Lecturer on International Health (*Health Policy and Management*).

Frances Gail Forster, SM in EnvH, Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

Eric Eliot Fortess, SD, Visiting Research Associate in Health Administration (*Institute for Health Research*).

Jeffrey Joseph Fredberg, PhD, Research Associate in Physiology (*Environmental Science and Physiology*).

Juliet Anne Fuhrman, PhD, Research Associate in Tropical Public Health.

Stephen Thomas Furlong, PhD, Research Associate in Tropical Public Health.

Anna Gotsis Gallagher, Assistant in Nutrition.

Richard Bradley Gamble, AM, Consultant on Population Problems (*Population Sciences*).

Armando Garsd, PhD, Lecturer on Biostatistics.

Arline Tabitha Geronimous, SD, Instructor in Population Sciences.

Margaret Gerteis, PhD, Research Associate in Health Policy (*Health Policy and Management*).

Edwin Martin Gold, MD, Visiting Lecturer on Maternal and Child Health (*Maternal and Child Health*).

Marlene Beth Goldman, SD, Research Associate in Epidemiology.

Rose Hannah Goldman, MD, MPH, MOH, Instructor in Occupational Medicine (*Environmental Science and Physiology*).

Jack Mark Goldstein, PhD, Consultant on Instrumentation (*Population Sciences*).

Richard Rafael Gonzalez, PhD, Visiting Lecturer on Environmental Science and Physiology.

Michele Louise Gougeon, MSS, SM in HSAd, Lecturer on Health Policy and Management.

Thomas Barr Graboys, MD, Research Associate in Cardiology (*Nutrition*).

George Francis Grady, MD, Visiting Lecturer on Applied Microbiology (*Cancer Biology*).

Rodrigo Guerrero, MD, SM in Hyg, DrPH, Visiting Lecturer on Population Sciences.

Eric Loren Hagestad, PhD, Research Associate in Physiology (*Environmental Science and Physiology*).

S. Katharine Gilbert Hammond, PhD, SM in EnvH, Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

Fay Lamson Hannon, MBA, Visiting Lecturer on Management (*Health Policy and Management*).

Sara Harkness, PhD, Research Associate in Maternal and Child Health and Lecturer on Population Sciences.

Lucia Stein Hatch, MPH, Visiting Lecturer on Health Policy and Management.

Stephen Havas, MD, MPH, SM in HPM, Visiting Lecturer on Health Policy and Management.

Kenneth Cronise Hayes, DVM, PhD, Lecturer on Nutrition.

Patricia Henson, PhD, Research Associate in Radiobiology (*Cancer Biology*).

James Hester, PhD, Visiting Lecturer on Health Policy and Management.

David Urius Himmelstein, MD, Research Associate in Human Variability (*Population Sciences*).

Christine Lee Hobart, DBA, Lecturer on Labor Relations (*Health Policy and Management*).

Rodney Hoff, SD in TrPH, Visiting Lecturer on Tropical Public Health.

Diane Elizabeth Hoffman, SM in HPM, Visiting Lecturer on Health Policy and Management.

Frank Macmillan Holden, MD, Visiting Lecturer on Health Services (*Health Policy and Management*).

William Henry Hollinshead, III, MD, MPH, Lecturer on Maternal and Child Health (*Maternal and Child Health*).

Hugh Robert Holtrop, MD, Research Associate and Lecturer on Population Studies (*Population Sciences*).

Marcel Rene Hommel, PhD, Visiting Lecturer on Tropical Public Health.

Donald Roswell Hopkins, MD, MPH, Visiting Lecturer on Tropical Public Health.

Frederic Gallatin Hoppin, Jr., MD, Research Associate in Physiology (*Environmental Science and Physiology*).

Joachim Hourihan, SD, Research Associate in Population Sciences.

Chang-I Hua, PhD, Research Associate in Population Studies (*Center for Population Sciences*).

Joseph Michael Hunt, SM, Research Associate in Human Ecology (*Population Sciences*).

Vilma Rose Hunt, AM, Visiting Lecturer on Environmental Science and Physiology.

Rudolph John Jaeger, PhD, Visiting Lecturer on Occupational and Environmental Toxicology (*Environmental Science and Physiology*).

Hershel Jick, MD, Lecturer on Epidemiology.

G. Timothy Johnson, MD, MPH, Visiting Lecturer on Health Services (*Health Policy and Management*).

Warren Kantrowitz, MD, Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

Myra Leonore Karstadt, PhD, JD, Lecturer on Occupational Health (*Environmental Science and Physiology*).

David Grant Kern, MD, MOH, SM in Phys, Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

William Russell Kimball, PhD, MD, Research Associate in Physiology (*Environmental Science and Physiology*).

David Mathias Kinzer, AB, Visiting Lecturer on Health Policy and Management.

Jonathan David Klein, MD, MPH, Visiting Lecturer on Behavioral Sciences.

Anthony Leader Komaroff, MD, Visiting Lecturer on Health Services (*Health Policy and Management*).

Jeffrey Powell Koplan, MD, MPH, Visiting Lecturer on Health Services (*Health Policy and Management*).

Petros Koutrakis, PhD, Research Associate in Environmental Science and Physiology.

Julius Louis Kovach, Dipl Chem Eng, Visiting Lecturer on Nuclear Air Cleaning (*Environmental Science and Physiology*).

Andrzej Stefan Krolewski, MD, Research Associate in Epidemiology.

Eva Hedvika Krug, SD, Visiting Scientist in Toxicology (to December 1986).

John Richard Agwin Lakey, PhD, Visiting Lecturer on Radiological Health (*Environmental Science and Physiology*).

Steven Lampert, MD, Research Associate in Cardiology (*Nutrition*).

Scott Macdonald Landfear, PhD, Research Associate in Tropical Public Health.

Philip John Landrigan, MD, MSc, Visiting Lecturer on Occupational Health (*Environmental Science and Physiology*).

Marc Karnis Landy, PhD, Lecturer on Political Science (*Health Policy and Management*).

Patricia Ann Lane, PhD, Visiting Lecturer on Population Sciences.

Chwen-Ching Lee, SM in HPM, Visiting Lecturer on Health Policy (*Health Policy and Management*).

Tun-Hou Lee, SD, Research Associate in Virology (*Cancer Biology*).

Richard Errol Letz, PhD, Research Associate in Physiology (*Environmental Science and Physiology*).

Charles Levenstein, PhD, SM in Phys, Lecturer on Occupational Health (*Environmental Science and Physiology*).

Sol Levine, PhD, Visiting Lecturer on Behavioral Sciences.

Barry Steven Levy, MD, MPH, Lecturer on Occupational Health (*Environmental Science and Physiology*).

Stephen Paul Lewontin, AM, Research Associate in Economic History (*Population Sciences*).

Frederick Pei Li, MD, Lecturer on Epidemiology.

Matthew Heng Liang, MD, MPH, Lecturer on Health Services (*Health Policy and Management*).

Howard Lewis Liber, PhD, Research Associate in Radiobiology (*Cancer Biology*).

Theo J. C. Lippeveld, MD, MPH, Lecturer on International Health (*Health Policy and Management*).

Stephen Lorch, SB, Lecturer on Health Services Administration (*Health Policy and Management*).

Mohamed Sayed el Lozy, MD, PhD, Lecturer on Nutrition.

Robert Denis Lynch, SD in Nutr, Research Associate in Nutrition.

James Harvey Maguire, MD, MPH, Instructor in Tropical Public Health.

Najwa Hanna Makhoul, PhD, Visiting Research Associate in Population Sciences.

Thomas William Mangione, PhD, Lecturer on Biostatistics.

Albert Anthony Mangone, EdD, Visiting Lecturer on Occupational Safety (*Environmental Science and Physiology*).

Harry Milton Marks, AM, Instructor in Health Policy (*Health Policy and Management*).

Robert John Marra, MBA, Visiting Lecturer on Health Services (*Health Policy and Management*).

Leonardo Jimenez Mata, SD in Hyg, Visiting Lecturer on Tropical Public Health.

Patricia Jane McArdle, EdD, SM in Epid, Instructor in Behavioral Sciences.

William Edward McAuliffe, PhD, Lecturer on Sociology (*Behavioral Sciences*).

Eleanor Thomsen McFadden, AM, Lecturer on Biostatistics.

Robert Burnett McGandy, MD, MPH, Consultant on Pathology (*Cancer Biology*).

Edward Noel McIntosh, MD, SD in Popl, Visiting Lecturer on Population Sciences.

Walter Mertens, PHD, Visiting Lecturer on Population Sciences.

Edward H. Michelson, PhD, Visiting Lecturer on Tropical Public Health.

Louis Howard Miller, MD, Visiting Lecturer on Tropical Public Health.

Stephan Sherman Miller, PhD, Research Associate in Microbiology (*Cancer Biology*).

Richard Francis Mollica, MD, Lecturer on Mental Health Policy (*Health Policy and Management*).

Edward Joseph Montminy, MPA, Visiting Lecturer on Health Services Administration (*Health Policy and Management*).

Phyllis S. Moore, SM, DNSc, Visiting Scholar in Maternal and Child Health.

Eileen Morley, EdD, Visiting Lecturer on Organizational Behavior (*Health Policy and Management*).

Diane H. Morris, PhD, Research Associate in Nutrition.

Robert Morris, DSW, Visiting Lecturer on Health Services (*Health Policy and Management*).

Alan Sydney Morrison, MD, SD in Epid, Lecturer on Epidemiology.

Richard Harold Morrow, MD, MPH, Visiting Lecturer on Tropical Public Health.

Samuel Leonard Moschella, MD, Visiting Lecturer on Tropical Public Health.

George Boswell Moseley, III, MBA, JD, Lecturer on Health Law (*Health Policy and Management*).

Kenneth Eugene Mott, MD, MPH, Visiting Lecturer on Tropical Public Health.

William Boss Munier, MD, MBA, Visiting Lecturer on Health Services Administration (*Health Policy and Management*).

Brian Logan Murphy, PhD, Visiting Lecturer on Environmental Risk Assessment (*Environmental Science and Physiology*).

Raymond Leo Harrington Murphy, Jr., MD, MPH, SD in Hyg, Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

Hatsumi Nagasawa, PhD, Research Associate in Radiobiology (*Cancer Biology*).

H. Richard Nesson, MD, Lecturer on Health Services (*Health Policy and Management*).

Franklin Allen Neva, MD, Visiting Lecturer on Tropical Public Health.

Eli Herbert Newberger, MD, SM in Epid, Lecturer on Child Health (*Maternal and Child Health*).

Faye Newfield, MPH, Lecturer on International Health (*Health Policy and Management*).

Robert James Nicolosi, PhD, Lecturer on Nutrition.

Jon Claiborne Nixon, PhD, Research Associate in Nutrition.

Ruth Sonntag Nussenzweig, MD, PhD, Visiting Lecturer on Tropical Public Health.

L. Christine Oliver, MD, MPH, SM in Phys, Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

Catherine Austin Overholt, SD in HPM, Lecturer on Nutrition.

Ralph Seal Paffenbarger, MPH, DrPH, Visiting Lecturer on Epidemiology.

Panagiotis Pantazis, PhD, Research Associate in Nutrition.

Theodore Michael Pass, PhD, Lecturer on Health Policy and Management.

Mercio Expedito Alves Pereira, MD, PhD, Visiting Lecturer on Tropical Public Health.

Alonzo Louis Plough, MPH, PhD, Visiting Lecturer on Health Policy (*Health Policy and Management*).

Philip Jack Podrid, MD, Research Associate in Cardiology (*Nutrition*).

Charles Joseph Puccia, PhD, Research Associate in Marine Ecology and Complex Systems (*Population Sciences*).

Thomas Oakley Pyle, MBA, Visiting Lecturer on Health Services (*Health Policy and Management*).

Mitchell Thornton Rabkin, MD, Visiting Lecturer on Health Services (*Health Policy and Management*).

Michael Baron Reid, PhD, Research Associate in Physiology (*Environmental Science and Physiology*).

Jean-Loupe Jacques Marie Romet-Lemonne, MD, Research Associate in Cancer Biology.

Richard Martin Rose, MD, Research Associate in Respiratory Biology (*Environmental Science and Physiology*).

Mark Lewis Rosenberg, MD, MPP, Visiting Lecturer on Health Services (*Health Policy and Management*).

Jacqueline Miller Rosenthal, MPH, Visiting Lecturer on Health Services (*Health Policy and Management*).

Fay Adrienne Rozovsky, JD, MPH, Visiting Lecturer on Health Law (*Health Policy and Management*).

Stephen Norman Rudnick, SD in EnvH, Research Associate in Environmental Health Engineering (*Environmental Science and Physiology*).

James Ryan, MD, Visiting Lecturer on Occupational Health (*Environmental Science and Physiology*).

Kenneth Wayne Samonds, PhD, Visiting Lecturer on Nutrition.

Sonja Sandberg, PhD, Research Associate and Lecturer on Clinical Decision Analysis (*Institute for Health Research and Health Policy and Management*).

Elizabeth Woodland Sands, JD, Visiting Lecturer on Health Services (*Health Policy and Management*).

Sitthivet Santikarn, PhD, Research Associate in Nutrition.

Philip Earl Sartwell, MD, MPH, Visiting Lecturer on Epidemiology.

A. Faye Schrater, PhD, Visiting Lecturer on Immunoparasitology (*Tropical Public Health*).

Ascher Jasha Segall, MD, DrPH, Visiting Lecturer on Health Services (*Health Policy and Management*).

Jack M. Selby, SB, Visiting Lecturer on Radiation Protection (*Environmental Science and Physiology*).

Edward Isaac Selig, JD, Visiting Lecturer on Environmental Law (*Environmental Science and Physiology*).

Stuart Howard Shapiro, MD, MPH, Visiting Lecturer on Health Services (*Health Policy and Management*).

Alan Peter Sheldon, MB, BChir, SM in Hyg, Lecturer on Behavioral Sciences (*Health Policy and Management*).

Stephen Alan Simon, MD, CM, MPH, Lecturer on International Health (*Health Policy and Management*).

Andrew Sivak, PhD, Visiting Lecturer on Cancer Biology.

William Allan Skornik, SM, Research Associate in Physiology (*Environmental Science and Physiology*).

Adrian Charles Sydney Sleigh, MB, BS, MPH, Lecturer on Tropical Public Health.

Temple Ferris Smith, PhD, Lecturer on Molecular Biophysics (*Biostatistics*).

Thomas Jay Smith, MPH, PhD, Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

Patricia Ann Sohl, MD, MPH, Visiting Lecturer on Health Policy (*Health Policy and Management*).

Nancy Lee Sprince, MD, MPH, Visiting Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

Kenneth Earl Stanley, PhD, Visiting Lecturer on Biostatistics.

William Boas Stason, MD, SM in Epid, Lecturer on Health Policy and Management.

Allen Howard Storm, MD, MPH, Lecturer on Occupational Health (*Environmental Science and Physiology*).

Donald Ernest Strange, MBA, Visiting Lecturer on Health Policy and Management.

Thomas John Stranova, MPH, Visiting Lecturer on Health Policy and Management.

Phillip George Stubblefield, MD, Visiting Lecturer on Maternal Health (*Maternal and Child Health*).

Charles McAfee Super, PhD, Research Associate in Psychology (*Nutrition*).

Theresa Dorothy Sweeney, PhD, Research Associate in Physiology (*Environmental Science and Physiology*).

Sandor Szabo, MD, PhD, MPH, Lecturer on Occupational Medicine (*Environmental Science and Physiology*).

Nobuyoshi Tachibana, MD, Visiting Scientist in Cancer Biology.

James Oliver Taylor, MD, Visiting Lecturer on Health Services (*Health Policy and Management*).

Clayton Lay Thomas, MD, MPH, Consultant on Human Reproduction (*Population Sciences*).

Mark Smith Thompson, PhD, Visiting Lecturer on Health Policy (*Health Policy and Management*).

Charles William Todd, PhD, Visiting Lecturer on Tropical Public Health.

Patricia Hyland Travers, SM, Visiting Lecturer on Occupational Health Nursing (*Environmental Science and Physiology*).

Eoin William Trevelyan, DBA, Lecturer on Management (*Health Policy and Management*).

Robert Scott Umans, PhD, Research Associate in Radiobiology (*Cancer Biology*) (to December 1986).

Richard William Valachovic, DMD, MPH, SM in HSAd, Lecturer on Dental Public Health (*Health Policy and Management*).

Flavio Luiz Schiek Valente, MD, MPH, Visiting Research Associate in Nutritional Epidemiology (*Population Sciences*).

Hannelore Falk Vanderschmidt, PhD, Visiting Lecturer on Health Policy and Management.

Michael Oliver Varner, SM in Hyg, Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

Helene Vetrovs, Assistant in Radiobiology (*Cancer Biology*).

Edward Francis Voelkel, Research Associate in Toxicology.

Franz Cornelius von Lichtenberg, MD, Lecturer on Tropical Public Health.

Christine Waternaoux, PhD, Lecturer on Biostatistics.

Carl Norman Wathne, SM, Visiting Lecturer on Health Services (*Health Policy and Management*).

David Howe Wegman, MD, SM in Phys, Visiting Lecturer on Occupational Health (*Environmental Science and Physiology*).

Ralph Robert Weichselbaum, MD, Visiting Lecturer on Radiobiology (*Cancer Biology*).

Jason Stanley Weisfeld, MD, MPH, Visiting Lecturer on Tropical Public Health.

Peter Fahey Weller, MD, Visiting Lecturer on Tropical Public Health.

Christian Bruce Wenger, MD, PhD, Visiting Research Associate in Physiology (*Environmental Science and Physiology*).

Barbara Graham Werner, PhD, Visiting Lecturer on Microbiology (*Cancer Biology*).

Donald Wertlieb, PhD, Research Associate in Clinical Psychology (*Institute for Health Research*).

Carmen Alonso Whipple, PhD, Research Associate and Lecturer on Population Studies (*Population Sciences*).

Jay Andrew Winsten, PhD, Lecturer on Health Services (*Health Policy and Management*).

Michele Sandra Winsten, SM in HPM, Visiting Lecturer on Health Policy and Management.

Jack Mikhail Wolfson, PhD, Research Associate in Environmental Health Sciences (*Environmental Science and Physiology*).

Joe David Wray, MD, MPH, Visiting Lecturer on Population Sciences.

Grace Wyshak, PhD, Lecturer on Biostatistics.

Stella Bernadette Yen, MD, MPH, Research Associate in Epidemiology.

George Yerganian, PhD, Senior Research Associate in Cytogenetics (*Population Sciences*).

Tera Singewald Younger, SM in HSAd, Visiting Lecturer on Health Policy and Management.

Richard A. Youngstrom, SM in EHS, Visiting Lecturer on Industrial Hygiene (*Environmental Science and Physiology*).

Wasim A. Zaman, SD, Visiting Research Associate in Population Studies (*Center for Population Sciences*).

Thomas Bjorn Zeltner, MD, Visiting Research Associate in Respiratory Biology (*Environmental Science and Physiology*).

Sally Zierler, EdM, DrPH, Research Associate in Epidemiology.

Official Register of
Harvard University (ISSN 0199-1787)

**Admissions Office
Harvard School of Public Health
677 Huntington Avenue
Boston, MA 02115**

**Second Class Postage
Paid
At
Boston, MA**